DOCUMENT RESUME

ED 327 693 CE 056 745

TITLE	Industrial Automation Mechanic Model Curriculum Project. Final Report.
INSTITUTION	Toledo Public Schools, Ohio.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE	90
CONTRACT	V199A90063
NOTE	453p.
PUB TYPE	Reports - Descriptive (141) -- Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC19 Plus Postage.
DESCRIPTORS	*Automation; Behavioral Objectives; Competency Based Education; Cooperative Programs; Curriculum Development; Demonstration Programs; *Fluid Mechanics; High Schools; Industrial Education; Instructional Materials; Learning Activities; Learning Modules; *Machine Tools; Manufacturing; Material Development; Mechanical Equipment; *Mechanics (Process); *Metal Working; Welding
IDENTIFIERS	Partnerships in Education

ABSTRACT

This document describes a demonstration program that developed secondary level competency-based instructional materials for industrial automation mechanics. Program activities included task list compilation, instructional materials research, learning activity packet (LAP) development, construction of lab elements, system implementation, certification test development and piloting, replication, and third-party evaluation. Following the seven-page final report, appendix I contains these materials: junior course outline and task list; senior course outline; staff information; floor plan and equipment list; and evaluation report. Appendix II contains key segments of the LAPs developed, which consist of lab activities, instructional aids, and support materials developed for the task list. Tasks are divided into these content areas: fluid power (tube line fabrication, pneumatics, hydraulic pumps, hydraulic valves, actuators, hydraulic circuits); mechanical power (bearings, clutches and brakes, couplings, fasteners, gears, v-belts and chains); machining (bench metals, lathe, vertical mill, horizontal mill, surface grinding, broaching); and metal fabrication (sheet metal, welding, oxyacetylene welding, shield metal arc welding, metal inert gas welding, tungsten inert gas welding). Each content area consists of 17 to 55 LAPs. Components of each LAP include performance objective, tasks, references, time range, and handouts. (YLB)

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ED327693

FINAL REPORT

INDUSTRIAL AUTOMATION MECHANIC

MODEL CURRICULUM PROJECT

LIBBEY SKILL CENTER
TOLEDO PUBLIC SCHOOLS

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

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COOPERATIVE DEMONSTRATION GRANT
US DEPARTMENT OF EDUCATION
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TABLE OF CONTENTS

FINAL REPORT

O INTRODUCTION

O PROGRAM DESCRIPTION

    NEED

    OBJECTIVES

O PROGRAM MANAGEMENT

    STAFFING

O PROGRAM COMPONENTS

O APPENDIX I

    Junior Course Outline --Yellow

    Task List -- Blue

    Senior Course Outline -- White

    Staff Information -- Yellow

    Floor Plan and Equipmnet List -- Pink

    Evaluator's Report -- Green

O APPENDIX II

    Fluid and Mechanical Power Transmission LAPs -- Buff

    Machining LAPs -- Pink

    Fabrication LAPs -- Green

INTRODUCTION

The Toledo Public School's Libbey Skill Center Industrial Automation Maintenance Program, in partnership with the National Fluid Power Society, Fluid Power Educational Foundation and the State of Ohio Department of Vocational Education, conducted a demonstration program under a grant awarded by the U.S. Department of Education. This eighteen month project ran from January 1, 1989 through June 30, 1990.

This Cooperative Demonstration Grant had as it's goal the development of competency-based instructional materials for Industrial Automation Mechanics (IAM). These mechanics are responsible for installing, operating, and maintaining high-tech industrial equipment systems and processes. This curriculum is an educational foundation under the professional certification system being developed and administered by the cooperating private sector professional organizations. The targeted populations to utilize this instructional package are secondary vocational students preparing to enter the work force and adults needing technical training and update. Theory and practice will be integrated into a self-paced, individualized, experiential competency-based learning system.

The cooperating private sector partners had requested the development of this program for industrial mechanics. They took an active part in the grant program with major professional and economic responsibilities for the development of a mechanic certification test.

PROGRAM DESCRIPTION

NEED

Securing competent industrial automation mechanics is becoming more and more difficult. The increased application of "High Technology" in today's automated factories has significantly changed the job description for an industrial maintenance mechanic. The reason for the changing job description is the increased automation on today's factory floor. Islands of automation have been integrated into complex networks. No longer can one machine stand alone without effecting the entire system. The Center for Occupational Research and Development has stated that "to maintain and repair the new sophisticated systems requires an interdisciplinary team approach. Therefore, the industrial mechanic has become a member of a systems analysis team composed of mechanics, technicians and engineers. The new job description requires a multi-craft mechanic with broad-based competencies."

Mechanics with interdisciplinary skills and knowledge must be prepared through well-designed programs that include the broad knowledge base required to apply the needed interdisciplinary skills. Therefore, it is important that a channel for prospective mechanics be established that would enable them to be certified and enter the industrial maintenance trade at a known level. The preparation of industrial mechanics is a key issue to the growth of high-tech industries in the United States thereby creating a need for systematic training dedicated to producing industrial automation maintenance professionals.

PROGRAM OBJECTIVES

In this private/public sector endeavor each partner supported the other's strengths. The private sector developed a certification exam for entry level industrial mechanics and a testing network. The public sector (Libbey Industrial Automation Program) developed an instructional system to support the National Industrial Mechanic Certification exam. In order to accomplish this goal the following seven objectives were identified:

1. Develop task list and competencies required for entry level industrial maintenance mechanics.

2. Develop an educational delivery system which maximized individualized learning systems and flexible scheduling to accommodate adult as well as secondary students.

3. Pilot certification testing with students who have participated in prototype curriculum.

4. Development and refinement of a replicable curriculum/lab educational package for piloting by the Ohio State Department of Vocational Education.

5. Assist students in career decision-making through the utilization of a vocational assessment instrument.

6. Dissemination of curriculum materials to be made available through private/public sectors participating in this demonstration project.

7. Guidelines for an accreditation system for both program and instructor will be developed.

PROGRAM MANAGEMENT

Staffing:

The staff included two full-time and six part-time employees. Resumes for the two full-time staff and the instructor are included in Appendix I.

Project Director: The Trade and Industrial Supervisor for Toledo Public Schools served in this position. He served as liaison between the Toledo Public School District and the Ohio State Department of Vocational Education on a 10% FTE cost share basis. The Project Director also was responsible for budget allocations.

Project Facilitator: The President of Buckeye Educational Systems, a private consulting firm located in Lexington, OH., had responsibility for hiring the Curriculum Specialist, Lab Assistant, and part-time assistance (student help and word processing person. He also managed the budget allocated to the consulting firm as well as the vocational assessment component.

Project Coordinator: The Libbey Skill Center Industrial Automation Instructor's responsibilities were to direct the curriculum specialist, the lab assistant and coordinate with local and national advisory counsels. Additionally he piloted all materials and the instructional system with the students.
He served full time in the summer of 1989 on the grant. 50% FTE cost share during the regular teaching day for 15 months. In addition he volunteered 100 % FTE during the summer of 1990 to assist in the completion of this work.

Curriculum Specialist: The Curriculum specialist was hired by the consulting firm for 100 % FTE starting in April 1989 to carry out all project activities related to individualized instructional materials and the associated delivery system. She also had the responsibility of preparing quarterly and final reports.

Lab Assistant: The Lab Assistant was hired by the consulting firm for 15 months starting in June of 1989. His responsibilities included assisting with the development of storage and retrieval systems, instructional aids, and needed support items for the individualized learning system.

Word Processor: The Word Processor services were secured for the last two months of the grant to assist the curriculum specialist in final copy preparation.

Student Assistant: A student was hired for a few hours a day for six months for general assistance.

DISCUSSION OF PROGRAM COMPONENTS

PROGRAM DEVELOPMENT (OBJECTIVES 1 AND 2)

Phase I: Task List Compilation

Compiling of a task list for a cross trained industrial automation mechanics. The task list was researched from the following resources:

- National Fluid Power Society's Blue Ribbon Certification Committee
- Industrial references (Local)
- Regional vocational Curriculum Coordination Centers
- On site visits to other Industrial Automation vocational programs.

The established tasks were organized around seven duties identified by the private sector "Blue Ribbon Certification Committee":

- Preventive Maintenance
- Assemble Components
- Rebuild Components
- Replace Components
- Minor Repairs
- Major Repairs
- Trouble-Shooting

This task list is for the first year of study. See Appendix I for a listing of the tasks under the following content areas:

- Mechanical Power Transmission *
- Fluid Power Transmission *
- Machining
- Fabrication
- Electronics *

* In our research we found the traditional industrial maintenance training programs were lacking in applied electronics (electro-hydraulics and electro-pneumatics), and in mechanical and fluid power transmission. It was determined by the advisory committee that an extensive electronic component as well as a power transmission (fluid, mechanical) core should be added to the overall program.

Phase II: Instructional Materials Research

A comprehensive materials (printed, visual and software) search was undertaken in an attempt to locate the most appropriate materials possible within the budget restraints. The instructor and curriculum specialist reviewed many material and instructional systems. When deemed feasible both high school and post-secondary students were asked to review materials before purchases were made. The carefully selected materials became an integral components of the instructional delivery system. Single concept video presentations were carefully selected to support the identified duties and tasks. Computer based instructional materials were secured to augment and maximize individualized learning system.

Phase III: Development of Learning Activity Packets (LAPs)

Generation of a bank of lab activities, instructional aids and support materials were developed for the task list. These materials were piloted with students throughout the 1989 - 1990 school year. Revisions, additions, and corrections were made before the final materials were prepared for this school year and inclusion in this report. See Appendix II for key segments of the Learning Activity Packets (LAPs).

Phase IV: Construction of Lab Elements

The key elements in an individualized instructional delivery system are visibility of all operations and processes that make up the learning environment. A workable storage and retrieval system was conceived and constructed. The labs were organized and developed to maximize ease of access. Color coding, distribution of materials to workstations and high visibility signage were utilized.

Phase V: System Implementation

Implementation, student adjustment and fine tuning of the system have just taken place with the beginning of this school year. The Instructor feels that student response has been extremely positive. He has made the following observations:

- an increase in average daily attendance,
- number of tasks completed by each student for the first month of school,
- positive self-management (time on task)
- a sense of pride/ownership of the learning process
- improved self-reliance and self-confidence

CERTIFICATION TEST DEVELOPMENT AND PILOTING (Objective 3)

The "Blue Ribbon Certification Committee" of the Fluid Power Society were responsible for development of the certification test and implementation of a testing system. Testing procedures have been developed. (This committee has contracted with Southern Illinois University to develop the Mechanics Level II Tests. This test will be composed of two parts: one in hydraulics and the other is pneumatics.) The Libbey IAM instructor participated in reviewing materials at several stages, and was invited to participate in a planning session for developing the testing system, during this past summer.

The concept of the certification test appears to be well received by the industrial mechanics, skilled trades associations and the maintenance managers. The projected date to begin testing is Fall of 1990.

REPLICATION (Objective number 4)

The Ohio State Department of Vocational Education has recently released a plan entitled "Action Plan for Accelerating the Modernization of Vocational Education in Ohio". The completion of this grant is timely as new approaches to instruction are important to this plan. The Assistant Director for Trade & Industrial Services has expressed that this grant report will be reviewed with utmost care and given highest consideration.

The instructor has already ben contacted by one Joint Vocational School to gain information for assisting them in establishing a similar program in their school.

Several members of the Fluid Power Society's "Blue Ribbon Committee" are working in their respective states with Vocational Directors to encourage the establishment of similar programs.

ASSESSMENT (Objective number 5)

The student interest skills survey was instituted as a way to provide students and their parents with information which would assist them in making good vocational choices. The Libbey students were piloted in November of 1989. The information gained from the survey will be beneficial in establishing baseline scores for future student testing.

DISSEMINATION OF CURRICULUM MATERIALS (Objective number 6)

Copies of this report will be available through the six regional Curriculum coordination Centers, the National Network for Curriculum Coordination in Vocational-technical Education, ERIC and the Fluid Power Education Foundation. The Fluid Power Education Foundation has a "Key Schools" program across the country who will receive information regarding these materials which will be available from their office. The Trade and Industrial and Career Education Department of the Ohio State Department of Vocational and Adult Education will also receive materials for distribution.

ACCREDITATION SYSTEM (Objective number 7)

This endeavor was to be conducted by the private sector. Their board of directors made a decision to pass on this opportunity at this time due to legal liabilities.

THIRD PARTY EVALUATOR

The third party evaluator is highly regarded curriculum consultant with the Instructional Materials Laboratory at Ohio State University. She visited the program on four different occasions to observe the development of each phase of the developmental process. Her report is enclosed in the Appendix I.

APPENDIX I

INDUSTRIAL AUTOMATION/ROBOTICS

LIBBEY SKILL CENTER

TOLEDO, OHIO

JUNIOR COURSE OUTLINE

MONDAY - WEDNESDAY - FRIDAY

1st 9 WEEKS:
- Bench Metal
- Sheet Metal
- Mechanical Power Transmission

2nd 9 WEEKS:
- Lathe Turning
- Oxy-Acetylene and Shielded Metal Arc Welding

3rd 9 WEEKS:
- Lathe Turning, Milling, & Surface Grinding
- Metal Inert Gas Welding (MIG)
- Fluid Power Transmission

4th 9 WEEKS:
- Lathe Turning, Milling Surface Grinding and Broaching
- Tungsten Inert Gas Welding (TIG)
- Fluid Power Transmission

TUESDAY - THURSDAY

1st 9 WEEKS:
- Tech Math 1
- Electronics 1
- Blueprint Reading/Sketching 1

2nd 9 WEEKS:
- Tech Math 2
- Electronics 2
- Blueprint Reading/Sketching 2

3rd 9 WEEKS:
- Tech Math 3
- Electronics 3
- Blueprint Reading/Sketching 3

4th 9 WEEKS:
- Tech Math 4
- Electronics 4
- Blueprint Reading/Sketching 4

JUNIOR COURSE DESCRIPTION

MACHINING (50 TASKS)

Bench Metal	Introduction to precision layout and measurement, hand and power tool usage (10 Tasks)
Lathe Turning	Facing, Turning to size, Taper Turning, Knurling, Threading, and Boring (20 Tasks)
Vertical/Horizontal Milling	End, Side, and Pocket Milling, Boring and Precision Drilling (18 Tasks)
Surface Grinding	Flat, end and Edge Grinding (1 Task)
Broaching	Hand Broaching on Arbor Press (1 Task)

METAL FABRICATION (32 TASKS)

Sheet Metal	Shearing, bending, joining flat, round and angle stock (9 Tasks)
Oxy-acetylene Welding and Cutting	Butt, lap, tee joints in flat position, brazing, piercing and cutting to specification (6 Tasks)
Shielded Metal Arc Welding (SMA)	Beading, butt, lap, tee joints in flat position (6 Tasks)
Metal Inert Gas Welding (MIG)	Beading, butt, lap, tee joints in flat position (6 Tasks)
Tungsten Inert Gas Welding (TIG)	Beading, butt, lap, tee joints in flat position (5 Tasks)

MECHANICAL POWER TRANSMISSION

Coupling Alignment	Alignment of flexible and rigid couplings
Gears and Speed Reducers	Identification, inspection and measurements of gears and gear driven speed reducers
Belt & Chain Drives	Identification, Inspection and Measurement of belt and chain drives

Fasteners	Identification, inspection, and measurement of bolts, screws and assorted mechanical fasteners
Clutches & Brakes	Identification, inspection, and measurement of various clutch and brake assemblies
Bearings	Identification, inspection and measurements of plain and anti-friction bearings. Assembly and disassembly of press-fit bearings.

FLUID POWER TRANSMISSION

Hydraulic Pumps	Identification and inspection of gear, vane and piston pumps
Hydraulic Valves	Identification and inspection of pressure, flow, and directional valves
Tube/Hose Fittings	Tube bending, hose assembly, identification of assorted fittings
Hydraulic Circuitry	Build and test circuits on hydraulic trainer
Pneumatics	Identification and inspection of pneumatic components
Pneumatic Circuitry	Build and test circuits on pneumatic trainer

TECHNICAL MATH

Technical Math 1	Whole numbers
Technical Math 2	Fractions
Technical Math 3	Algebra
Technical Math 4	Geometry

BLUEPRINT READING/SKETCHING

Blueprint Reading/ Sketching 1	Technical Sketching
Blueprint Reading/ Sketching 2	Mechanical
Blueprint Reading/ Sketching 3	Fluid Power
Blueprint Reading/ Sketching 4	Electrical

ELECTRONICS

Electronics Level 1	Introduction to Electronic Components and Circuit Assembly
Electronics Level 2	AC/DC And the Fundamentals of Power Supplies
Electronics Level 3	Amplifiers and Oscillators
Electronics Level 4	Digital Electronics and Integrated Circuits

TIME SCHEDULE

SHOP WORK

MONDAY - WEDNESDAY - FRIDAY

11:35 A.M. DRESSED AND AT WORK STATION

2:05 P.M. INSPECTORS PUT THEIR TOOLS AWAY AND CHANGE CLOTHES

2:10 P.M. FABRICATION - CHANGE CLOTHES
MACHINING - CLEAN UP YOUR WORK AREA *
POWER TRANSMISSION - RETURN TOOLS

2:15 P.M. FABRICATION - CLEAN UP YOUR WORK AREA *
MACHINING - RETURN TOOLS
POWER TRANSMISSION - CHANGE CLOTHES

2:20 P.M. FABRICATION - RETURN TOOLS
MACHINING - CHANGE CLOTHES
POWER TRANSMISSION - CLEAN UP YOUR WORK AREA *

2:25 P.M. ENTER CLASSROOM TO RECORD ACCOMPLISHMENTS IN YOUR NOTEBOOK

* CLEAN UP YOUR WORK AREA:
  o BENCHES/TABLES/MACHINES CLEANED
  o RAGS RETURNED TO APPROPRIATE PLACE AT EACH WORKSTATION
  o FLOORS CLEANED

TUESDAY AND THURSDAY - ELECTRONICS, MATH AND BLUEPRINT READING/SKETCHING

11:35 A.M. TECH MATH
12:05 P.M. ELECTRONICS
1:50 P.M. BLUEPRINT READING AND SKETCHING
2:25 P.M. RECORD ACCOMPLISHMENTS IN YOUR NOTEBOOK

FORMAT FOR ALL WRITTEN WORK ASSIGNMENTS

NAME OF SUBJECT **

ASSIGNMENT # YOUR NAME

DATE______

- o USE A FULL SHEET OF PAPER FOR EACH EXERCISE
- o USE PENCILS ONLY
- o WRITE OUT EACH PROBLEM (THIS ALLOWS YOU TO PRACTICE YOUR TECHNICAL WRITING FORM)
- o CIRCLE ALL ANSWERS
- o SIGNAL YOUR INSTRUCTOR ***
- o PLACE EACH ASSIGNMENT SHEET IN THE PROPER SECTION OF YOUR NOTEBOOK
- o ALL WORK MUST BE COMPLETED AND IN APPROPRIATE SECTION AT THE TIME OF THE NINE WEEK TEST.

** Electronic, Tech Math 1 -4, Blueprint Reading/Sketching 1 -4 , shop work LAP #

*** **RED** HELP **BLUE** CHECK MY WORK **YELLOW** I AM OK

PROCEDURES FOR SHOP WORK

MONDAY -WEDNESDAY -FRIDAY

- YOU ARE TO BE DRESSED, WEARING SAFETY EQUIPMENT, AND AT YOUR DESIGNATED WORK STATION WHEN THE TARDY BELL RINGS.

- EACH WEEK THERE WILL BE A SAFETY INSPECTOR AND POSITION. A TOOL ROOM INSPECTOR APPOINTED WITH AN ALTERNATE FOR EACH. THE ALTERNATE WILL BECOME THE INSPECTOR THE NEXT WEEK AND IN THE ABSENCE OF THE ASSIGNED INSPECTOR WILL ASSUME THE RESPONSIBILITIES FOR THAT POSITION. THE CHART POSTING THIS ASSIGNMENT IS IN THE SHOP.

JOB DESCRIPTIONS FOR THE INSPECTORS

SAFETY INSPECTORS:

- OBSERVE SAFETY CONDITION DURING PREPARATIONS FOR WORK AND PREPARATION FOR DISMISSAL:
  - PROPER DRESS
  - SAFETY GLASSES
  - ORDERLINESS
  - GENERAL CONDUCT

- COMPLETE A DAILY SAFETY FORM AND FILE WITH THE INSTRUCTOR

TOOL ROOM INSPECTOR:

- INSPECT TOOL ROOM PRIOR TO USAGE AND AT THE END OF THE DAY

- COMPLETE DAILY TOOL ROOM REPORT AND FILE WITH THE INSTRUCTOR.

STUDENT ORGANIZATION

- THE CLASS WILL BE DIVIDED INTO THREE TEAMS. YOU WILL PLAN WITH YOUR TEAM EACH NINE WEEK IN THE FOLLOWING THREE AREA:

  - FABRICATION: SHEET METAL AND WELDING

  - MACHINING: BENCH METAL, LATHES, MILLING,GRINDING & BROACHING

  - POWER TRANSMISSION: MECHANICAL AND FLUIDS

YOU WILL WORK IN ALL AREA EACH NINE WEEKS.

	FABRICATION	MACHINING	POWER TRANSMISSION
ROTATION 1	X	Z	Y
ROTATION 2	Y	X	Z
ROTATION 3	Z	Y	X

SEE EXAMPLES ON FOLLOWING PAGES FORPLANNING IN EACH OF THE AREAS PLANNING CHART.

POWER TRANSMISSION PLANNING CHART

YOU WILL WORK IN POWER TRANSMISSION 3 HOURS A DAY FOR 17 DAYS DURING THE FIRST SEMESTER. THIS WILL BE DIVIDED INTO TWO DAYS AT EACH BENCH WITH 5 EXTRA DAYS AT THE END OF THE SEMESTER FOR MAKE UP OR FOR "QUEST" WORK.

SUBJECT AREA	DAYS IN					
POWER TRANS.	1&2	3&4	5&6	7&8	9&10	
DATE	SEPT. 10&12	14&17	19&21	24&26		
V. BELTS/ CHAINS	J.E.	M.H.				
CLUTCHES & BRAKES	M.H.	J.E.				
BEARINGS			J.E.	M.H.		
COUPLING ALIGNMENT			M.H.	J.E.		
GEARS/SPEED REDUCERS						
FASTENER						

FABRICATION PLANNING CHART

YOU WILL HAVE 9 DAYS IN THIS AREA. tHE SECOND NINE WEEKS YOU WIL DIVIDE YOUR TIME BETWEEN oXY-A AND ARC.

FABRICATION	NOVEMBER								
DATE	5	7	9	12	14	16	19	21	26
OXY-A # 1	JE	JE	JE					JE	JE
OXY-A # 2				MH	MH	MH	MH		
ARC # 1	MH	MH	MH	JE	JE	JE	JE	MH	MH
ARC # 2									
ARC # 3									

MACHINE SHOP

YOU WILL WORK IN THE MACHINE SHOP 3 HOURS A DAY FOR 18 DAYS DURING THE SECOND SEMESTER. YOU WILL SIGN UP FOR THE VERTICAL MILL AND THE HORIZONTAL MILL FOR TWO BLOCKS EACH BLOCK WILL BE TWO DAYS. THE OTHER DAYS YOU WILL BE WORKING AT A LATHE.

SUBJECT AREA	DAYS IN EACH .					
MACHINE SHOP	1&2	3&4	5&6	7&8	9&10	
DATE	JAN. 23&25	28&30	FEB. 1&4	6&8	11&13	15&20
V. MILL	J.E.	J.E.				
H. MILL	M.H.	M.H.				
LATHE # 1			J.E.			
LATHE # 2				J.E.		
LATHE # 3					J.E.	
LATHE # 4						J.E.

DATE	FEB. 22&25	MARCH 27&1	4&6	8&11	13&15	18&20
V. MILL						
H. MILL						
LATHE # 1	J.E.	J.E.	J.E.	J.E.	J.E.	J.E.
LATHE # 2	M.H.	M.H.	M.H.	M.H.	M.H.	M.H.
LATHE # 3						
LATHE # 4						

FLUID POWER TRANSMISSION PLANNING CHART

YOU WILL WORK IN POWER TRANSMISSION 3 HOURS A DAY FOR 17 DAYS DURING THE FIRST SEMESTER. THIS WILL BE DIVIDED INTO TWO DAYS AT EACH BENCH WITH 5 EXTRA DAYS AT THE END OF THE SEMESTER FOR MAKE UP OR FOR "QUEST" WORK.

SUBJECT AREA .	DAYS IN
FLUID POWER TRANS.	

DATE							
HYDRAULIC PUMPS							
HYDRAULIC PUMPS							
TUBE/HOSE FITTINGS							
HYDRAULIC CIRCUITRY							
PNEUMATICS							
PNEUMATIC CIRCUITRY							

GRADING SYSTEM

80 % FROM DAILY WORK

. MATH	15 %
. BLUEPRINT READING/SKETCHING	15 %
. ELECTRONICS	15 %
. SHOP WORK	15 %
. WORK HABITS (Attitude, cooperativieness, staying on task)	20 %

20 % NINE WEEK TEST

EXAMPLE: FIRST NINE WEEKS

SHOP WORK: LAPs PROJECTED

FABRICATION - 9	MACHINE SHOP - 10	POWER TRANSMISSION - 12
QUEST - A	QUEST - A	QUEST - A
9 LAPs- B	10 LAPs - B	12 LAPs - B
8 LAPs - C	9 LAPs - C	11 LAPs - C
7 LAPs - D	8 LAPs - D	10 LAPs - D

MATH: CALCULATIONS AND FORM (USE TECHNICAL STYLE OF WRITING)
16 ASSIGNMENTS - 16 = A, 15 = B, 14 = C, 13 = D

BLUE PRINT READING/SKETCHING:
16 ASSIGNMENTS - 16 = A, 15 = B, 14 = C, 13 = D

ELECTRONICS:
LEVEL I, 13 ASSIGNMENTS - QUEST = A, 13 = B, 12 = C, 11 = D

JOE SMITH HAS:	"B" IN SHOP (B, C, & B)	3 POINTS
	"C" IN MATH	2 POINTS
	"A" IN BL.P/S	4 POINTS
	"B" IN ELECTRONICS	3 POINTS
	"B" IN WORK HABITS	3 POINTS
	80 % DAILY WORK	15 POINTS TOTAL

15 DIVIDED BY 5 = 3 FOR A "B" ON DAILY WORK

20 % NINE WEEKS TEST "C"

DAILY WORK 3 POINTS X 4 **** (80%) = 12
NINE WEEKS TEST 2 POINTS X 1 (20%) = 2
TOTAL POINTS 14 DIVIDED BY 5 = 2.8

THEREFORE THE NINE WEEK GRADE IS A "C+"

**** 80% = 4/5 20% = 1/5

SAFETY INSPECTOR'S REPORT

DATE: ____________ INSPECTOR: ________________________

OBSERVATIONS:

SAFETY APPAREL

GLASSES ___ EVERYONE OKAY

REMINDED ________________ & ________________

LEATHER SHOES ___ EVERY ONE OKAY

REMINDED ________________ & ________________

SHIRT TUCKED-IN ___ EVERYONE OKAY

REMINDED ________________ & ________________

LOCKER AREA

ORDERLINESS OF DRESSING AREA ___ OKAY

REMINDED ________________ & ________________

CLEANLINESS OF SINK AREA ___ OKAY

REMINDED ________________ & ________________

LOCKERS ARE TO BE USED ONLY FOR ITEMS RELATED TO SHOP WORK ___ OKAY

REMINDED ________________ & ________________

SHOP AREA

FLOOR FREE OF HAZARDS ___ OKAY

REMINDED ________________ & ________________

EQUIPMENT OILED & CLEANED ___ OKAY

REMINDED ________________ & ________________

WORK BENCHES CLEARED & CLEANED ___ OKAY

REMINDED ________________ & ________________

TOOL ROOM INSPECTOR'S REPORT

DATE: ______________ INSPECTOR ______________________________

PRE USAGE CHECK:

1. TOOLS __ OKAY OR
   - A. MISSING ____________, ______________ & ___________
   - B. DIRTY ____________, ______________ & ___________
   - C. DAMAGED ____________, ______________ & ___________
2. COUNTER CLEAR 7 CLEAN __ OKAY OR _____
3. FLOOR __ OKAY OR ____________________
4. ELECTRIC CORDS CORRECTLY WRAPPED __ OKAY

   OR __________________________

POST-USAGE CHECK:

1. TOOLS __ OKAY OR
   - A. MISSING ____________, ______________ & ___________
   - B. DIRTY ____________, ______________ & ___________
   - C. DAMAGED ____________, ______________ & ___________
   - D. BROKEN ____________, ______________ & ___________
2. COUNTER CLEAR 7 CLEAN __ OKAY OR ________________
3. FLOOR __ OKAY OR ________________________________
4. ELECTRIC CORDS CORRECTLY WRAPPED __ OKAY

   OR __________________________
5. WHO DID YOU HAVE TO REMIND ________________________ &

   _________________ & _________________________________

TASK LIST

MISSION STATEMENT:

To prepare entry level industrial mechanics to maintain, install, and repair high-tech automated machine systems.

VOCATIONAL DUTIES:

PREVENTIVE MAINTENANCE
ASSEMBLE COMPONENTS
REBUILD COMPONENTS
REPLACE COMPONENTS
MINOR REPAIRS
MAJOR REPAIRS
TROUBLE-SHOOTING

TASKS FOR FIRST YEAR:

Begin on the next page

INDUSTRIAL AUTOMATION MAINTENANCE/ROBOTICS INDIVIDUALIZED CURRICULUM PLAN

FIRST YEAR

FOUR AREAS OF INSTRUCTION

ELECTRONICS 144 hrs.

- 4 LEVELS
  - Electronic Components and circuits assembly
  - DC/AC and Power Supplies
  - Solid-State Amplifiers and Oscillators
  - Digital Electronics and Intigrated Circuits

RELATED 72 hrs.

- Blueprint Reading
- Shop Math

FABRICATION 108 hrs.

- Sheet Metal
- Welding
  - Shielded Metal Arc
  - Oxy-acetylene
    - Welding
    - Brazing
    - Flame Cutting
  - Metal Inert Gas
  - Tungsten Inert Gas

MACHINE SHOP 108 hrs.

- Bench Metals
- Lathes
- Milling
  - Vertical
  - Horizontal
- Broaching
- Surface Grinding

POWER TRANSMISSION 108 hrs.

- Mechanical
  - Bearings
  - Clutches/Brakes
  - Coupling Alignment
  - Fasteners
  - Gears/speed Reducers
  - V-belts/Chains
- Fluid Power
  - Pneumatic - Hydraulic
    - Actuators
    - Circuits
    - Cylinders
    - Filtration
    - Lines/Fittings
    - Motors
    - Pumps
    - Sealants
    - Troubleshooting
    - Valves

Each students will rotate through all areas each nine weeks.

M - W - F = Fabrication, Machine Shop and Power Transmission
(9 days in each area per nine weeks)
T - TH = Electronics and Related

METAL FABRICATION

SHEET METAL

LAP 0	SAFETY - Measurement
LAP 1	Perform layout, hand shearing, and hand punching on flat sheet stock
LAP 2	Demonstrate proper techniques for straight, V, and slant notching
LAP 3	Perform layout and cutting to specifications
	Perform outside seam, inside seam, and groove seam to specifications
	Perform spot seld and op rivet to specifications
LAP 4	Construct sheet metal rectangular box to specification
LAP 5	Construct coupling guard to specification
LAP 6	Construct round pipe with 1/4" groove seam to specifications
LAP 7	Perform bending of flat stock to angular specifications
LAP 8	Construct 90 degree angle iron mitered corner
LAP 9	Form "U" bolt from 3/8" round stock to specifications

WELDING

LAP 0	SAFETY - Metal Identification - Tool Identification and Location

OXY-ACETYLENE

LAP 0	SAFETY and Set-up for Oxy-acetylene
LAP 1	Produce stringer beads in flat position without and with the use of a filler metal
LAP 2	Produce quality lap joint fillet welds in flat position
LAP 3	Produce quality square groove weld on a butt joint in the flat position using the keyhole technique

LAP 4 Produce brazed butt joint

LAP 5 Produce a brazed pipe joint

LAP 6 Produce quality spuare bevel and a circular flame cut edges

SHIELD METAL ARC

LAP 0 State SAFETY procedures

Utilize simulator to practice angle, distance and speed of the electrode in relationship to the work piece

LAP 1 Demonstrate ability to adjust machine settings, strike an arc, manipulate the electrode, and read the puddle to produce button beads

LAP 2 Produce short beads on flat surface

LAP 3 Produce a pad of beads in flat position

LAP 4 Produce a fillet weld lap joint

LAP 5 Produce square groove butt joint in horizontal position

LAP 6 Produce fillet weld (3 bead) Tee joint in horizontal position

Perform visual inspection

METAL INERT GAS WELDING (MIG)

LAP 0 State SAFETY Rules and procedures

Demonstrate equipment setting

Practice on simulator feed, speed, and angel

LAP 1 Produce button beads in flat position

LAP 2 Produce a quality short beads in flat position

LAP 3 Produce a quality outside corner joint in flat position

LAP 4 Produce a quality lap joint in flat position

LAP 5 Produce a quality butt joint

LAP 6 produce a quality Tee joint in flat position

TUNGSTEN INERT GAS

LAP 0 Sate SAFETY rules and set-up procedures

Practice on simulator for feed, speed, angel

LAP 1 Produce short beads in flat position on aluminium stock

LAP 2 Produce outside corner joint in flat position on aluminum stock

LAP 3 Produce quality lap joint in flat position on aluminum stock

LAP 4 Produce quality butt joint in flat position on aluminium stock

LAP 5 Produce quality Tee joint in flat position on aluminium stock

MACHINE SHOP

BENCH METALS

LAP 0 SAFETY - Measurement - Tool identification and location

LAP 1 Demonstrate the ability to use a steel ruler in graduations up to 1/32", (utilizing a linear and circular measurement kit), within a tolerance of +-1/32".

LAP 2 Demonstrate ability to use a hook ruler to measure linear and circular items with a tolerance of + - 1/32"

LAP 3 Demonstrate the ability to use a steel ruler set CALIPERS and take inside/outside measurements of designated materials with a tolerance of + - 1/32"

LAP 4 Demonstrate use of a combination square to take measurement and perform a layout to specifications within a tolerance of + - 1/32"

LAP 5 Demonstrate the ability to set and use a dial calliper for outside, depth, and inside measurements within a tolerance of + - .010

LAP 6 Demonstrated the ability to create a precision layout according to given to specification, within a tolerance of + - 1 /32", + - 1 degree

LAP 7 Demonstrate the ability to fabricate the layout completed in LAP 6 using hand tools and pedestal grinder to within + - 1/32" or + - 1 degree of specifications

LAP 8 Demonstrate the ability to read layout specifications, and perform layout techniques for hole conditioning, within a tolerance of + - 1/32"

LAP 9 Demonstrate the ability to read layout specifications, and perform countersinking and counterboring operations, within a tolerance of +-1/32" (from LAP 8)

LAP 10 Demonstrate the ability to read layout specifications, and perform a tapping operation within a tolerance of + - 1/32", + - 1 degree

LATHES

LAP 0 State SAFETY rules

Identify major parts and accessories of an engine lathe

State rules for use, care and cleaning of the engine lathe

Use shop formulas and charts to determine lathe speeds, feeds and deepths of cuts

LAP 1 Demonstrate the ability to face an aluminum part to specified length with + - .001 tolerance

LAP 2 Perform a straight turning operation of aluminum stock to specifications +- .001 tolerance

LAP 3 Face a steel part to specified length within +- .001 tolerance

LAP 4 Perform a straight turning operation on steel to specifications within +- .001 tolerence

LAP 5 Turn square shoulder to length as specified +- .001 tolerence

LAP 6 Use dial indicator to align work in four-jaw chuck

LAP 7 Perform champher operations to specifications

LAP 8 Perform recessing operations to specifications

LAP 9 Perform center-drilling operations to specifications

LAP 10 Perform knurling operations to specifications

LAP 11 Perform drilling and reaming operations to specifications

LAP 12 Perform tapping operations to specifications

LAP 13 Perform cut-off operation to specifications

LAP 14 Perform turning between centers operation to specifications

LAP 15 Perform a taper with taper attachment

LAP 16 Perform taper turning with a compound to specification

LAP 17 Perform boring operation to specifications

LAP 18 Cut external threads to a relief as specified

LAP 19 Perform thread pick up to specification

LAP 20 Perform internal thread cutting to specifications

MILLING

Vertical

LAP 0 Demonstrate knowledge of SAFETY procedures regarding vertical milling

Identify vertical milling machine controls

Define vertical milling operations

LAP 1 Mount and remove cutter and cutter holder as specified

LAP 2 Demonstrate use of specified machine controls

LAP 3 Mount and align vise as specified to within a + - .001 tolerance

LAP 4 Align head square to table as specified to within a + - .001 tolerance

LAP 5 Demonstrate squaring stock to size as specified

LAP 6 Perform hole conditioning to specifications

LAP 7 Perform specified side milling operation to within + - .010 tolerance

LAP 8 Perform end milling operation to specifications within + - .010 tolerance

LAP 9 Mill keyseat with keyseat cutter and a key slot with end mill to specifications within a tolerance of + - .010

LAP 10 Mill a rectangular slot to specifications within a tolerance of = - .010

LAP 11 Perform precision locating drilling, and reaming of holes to specification within a tolerance of + - .001

LAP 12 Demonstrate ability to align a bore concentric to the spindle as specified

LAP 13 Perform a boring operation to specifications within a tolerance of + - .003

Horizontal

LAP 0 Demonstrate knowledge of SAFETY, procedures regarding horizontal milling

LAP 1 Demonstrate mounting of an arbor to specifications

LAP 2 Demonstrate mount cutter to arbor as specified

LAP 3 Demonstrate alignment of a vise as specified

LAP 4 Demonstrate ability to mill a square to specifications within + - .010 tolerance

LAP 5 Demonstrate ability to mill a key slot to specification within tolerance of + - .010

SURFACE GRINDING

LAP 0 State SAFETY procedures related to surface grinding

LAP 1 Surface grind a work piece square and parallel

BROACHING

LAP 1 Perform hand broaching operation to cut an internal keyway

POWER TRANSMISSION

MECHANICAL

LAP 0 SAFETY - Measurement - Tool Identification and location

Clutches - BRAKES

LAP 1 Identify, disassemble and assemble a oneway possitive engagement clutch

LAP 2 Disassemble, sketch, measure, and reassemble a clutch and a brake assemblies

LAP 3 Inspect, disasssemble, repair and reassemble a QD Hub on a clutch/brake assembly

Gears/Speed Reducers

LAP 1 Identify, measure and size major types of gears utilizing manufactures specifications

LAP 2 Demonstrate disassembly, calculate ratio, and reasemble a compound gear train

LAP 3 Disassemble, inspect, assemble and test speed reducer (count and calculate ratio - inspect)

Bearings

LAP 1 Identify major types of bearings and figure load

LAP 2 Install and remove plain and anti-friction bearings with the Mechanical Arbor Press

LAP 3 Disassemble, inspect, reassemble a speed reducer with three types of bearings

Coupling Alignment

LAP 1 Assemble and align a flexible (chain type) coupling using a feeler gauge and straight edge

Fasteners

LAP 1	Demonstrate ability to identify and measure machine bolts and screws
LAP 2	Perform a layout from bluepirnt
	Perfomr a drilling operation to layout specifications
	Tap external and internal threads
	Repair demaged threads
	Remove a broken bolt/screw
LAP 3	Assemble and disassemble component parts requiring torque

V-Belts and Chains

LAP 1	Identify type of chains
	Size chain and sprockets
	Calculate the speed ratio of given chain/sprocket
LAP 2	Disassemble a chaindrive assemble
	Identify and measure chains and sprocket to calculate speed ratio
	Reassemble and realign the sprockets and tension the chain
LAP 3	Identify, size, alaign and tension a V-Belt

FLUID POWER

LAP 0	SAFETY, Tool Identification and Location

PNEUMATICS

LAP 1	Disassemble, inspect and assemble filter, regulator and lubricator unit
LAP 2	Disassemble, inspect and assemble a pneumatic directional control valve

LAP 3 Disassemble, inspect and assemble a pneumatic cylinder

LAP 4 Disassemble, inspect and assemble pneumatic motor

LAP 5 Disassemble, inspect and assemble a pneumatic hand tool

LAP 6 Assemble, verify and troubleshoot air logic system

PUMPS

LAP 1 Disassemble, inspect and reassemble a gear pump

LAP 2 Disassemble, inspect and reassemble a vane pump

LAP 3 Disassemble, inspect and reassemble a piston pump

LAP 4 Test vane pump for mechanical and volumetric efficiency

ACTUATORS

LAP 1 Disassemble, inspect and reassemble a hydraulic cylinder

TUBE LINE FABRICATION

LAP 1 Layout and bend tubing to specifications

LAP 2 Identify and measure various types of fittings commonly used with tubing

LAP 3 Cut, flare, fit tube to fittings

LAP 4 Install and test tube line fabrication to pneumatic power supply

HOSE ASSEMBLY

LAP 1 Identify and measure various types of hose-ends used in hydraulic systems

LAP 2 Identify and measure various types of fittings used in hydraulic systems

LAP 3 Crimp hose ends and fittings on hydraulic hose

LAP 4 Install and test hose assemble on hydraulic power supply

LAP 5 Cut, thread and fit pipe

LAP 6 Install pipe assemble according to schematic

CIRCUITS

LAP 1 Demonstrate basic linear hydraulic circuit

LAP 2 Demonstrate regenerative circuit

LAP 3 Demonstrate sequencing circuit

LAP 4 Demonstrate sequencing circuits with limited clamping pressure

LAP 5 Demonstrate counterbalance circuit

LAP 6 Demonstrate hydraulic circuit with speed control

LAP 7 Demonstrate traverse and feed circuit

LAP 8 Demonstrate sequencing circuit with speed control

LAP 9 Demonstrate basic hydraulic rotary motion circuit

LAP 10 Demonstrate hydraulic rotary drive with speed control

LAP 11 Troubleshoot hydraulic circuit

VALVES

LAP 1 Disassemble, inspect, assemble and test pressure control valves

LAP 2 Disassemble, inspect, assemble and test flow control valves

LAP 3 Disassemble, inspect, assemble and test directional control valves

LAP 4 Given a defective hydraulic valve, locate necessary information for order replacement parts

ELECTRONICS

LAP 1	Identify resistors using color code
LAP 2	Connect LEDs in simple circuit
LAP 3	Connect seven segment display in circuit
LAP 4	Connect transistors in a switching circuit
LAP 5	Connect transistors in a switching circuit
LAP 6	Connect the SCR in a latching circuit
LAP 7	Connect the 555 Timer IC in a timer circuit
LAP 8	Vary the values of resistors to control the timer
LAP 9	Observe voltage as a result of current change
LAP 10	Observe change current as resistance changes
LAP 11	Connect a transformer to step-up voltage
LAP 12	Connect a transformer to step-down voltage
LAP 13	Determine how a diode is connected to act as a half-wave rectifier
LAP 14	Determine how four diodes are connected to act as a full-wave rectifier
LAP 15	Investigate the charging and discharging of a capacitor
LAP 16	Investigate the effects of connecting capacitors in series and in parallel
LAP 17	Demonstrate how a fixed and variable voltage divider works
LAP 18	Demonstrate how a zener diode regulates voltage
LAP 19	Examine how a bleeder resistor functions
LAP 20	Examine how a dual-polarity power supply functions
LAP 21	Assemble a circuit to test transistors
LAP 22	Test transistors to determine if they are good or bad, and whether they are an NPN or PNP type
LAP 23	Demonstrate the operation of a photocell

LAP 24	Assemble a sensitive light meter using a single transistor for amplification
LAP 25	Assemble a basic two transistor audio amplifier
LAP 26	Demonstrate how an amplifier, with feedback, becomes an oscillator
LAP 27	Assemble a basic code practice oscillator
LAP 28	Convert the basic oscillator into an electronic metronome
LAP 29	Assemble an oscillator to produce a sounds
LAP 30	Demonstrate how to vary a sounds
LAP 31	Demonstrate the operation of an AND logic gate
LAP 32	Demonstrate the operation of a NAND logic gate
LAP 33	Demonstrate the operation of an OR logic gate
LAP 34	Demonstrate the operation of an NOR logic gate
LAP 35	Assemble an astable multivibrator using a 555 IC
LAP 36	Assemble a monstable multivibrator using a 555 IC
LAP 37	Demonstrate how a 7490 IC counts incoming pulses and supplies a running total in binary
LAP 38	Demonstrate how to connect a clock pulse to the IC so that it counts automatically
LAP 39	Assemble an LED sequence generator
LAP 40	Assemble a digital counting circuit
LAP 41	Build seven different circuits and develop an understanding of their functions
LAP 42	Verify the boolean p14 equation and the truth table of the AND gate.
LAP 42	Demonstrate the use of inter-connection schematics with a Digital Trainer
LAP 43	Demonstrate AND gate as a control element (receiving two inputs at once and produce one output)

LAP 44	Build a pulse train control circuit using the AND gate and verify it
LAP 45	Build a four-input AND gate using three two-input AND gates, and analyze with truth table
LAP 46	Build and test a real four-input alarm system with light and sound indicators
LAP 47	Demonstrate the use of a NAND gate to construct one of the seven logic gates
LAP 48	Build a 0 to 99 second programmable timer
LAP 49	Build and experiments with an RS Flip-flop (two NAND gages, a four bit memory, and debounced switch)
LAP 50	Demonstrate usage of a JK Flip-Flop can work either as a clocked RS Flip-Flop or as a divider
LAP 51	Demonstrate usage of a 74191: four bit, ripple, Up-down presettable IC counter
LAP 52	Build a high-impedance, high-sensitivity DC voltmeter from an ordinary analog multimeter by using an operational amplifier stage
LAP 53	Program a micrometer/robot system
LAP 54	Troubleshoot a micro-mentor system
LAP 55	Operate robot manually with a keypad programmer
LAP 56	Construct from a diagram the programmer board
LAP 57	Construct from a diagram the CPU board
LAP 58	Construct from a the robot relay control board
LAP 59	Demonstrate ability to read the schematic diagram for the micro-mentor system
LAP 60	Demonstrate ability to read schematic diagram of the robot relay control Board
LAP 61	Demonstrate proper usage of the micro-mentor robot control interconnection chart
LAP 62	Demonstrate proper usage of the instruction set for the 8085 micro-mentor microprocessor system to operate the robot

INDUSTRIAL AUTOMATION/ROBOTICS

LIBBEY HIGH SCHOOL

TOLEDO, OHIO

SENIOR COURSE OUTLINE

MONDAY - WEDNESDAY - FRIDAY

1st 9 WEEKS: Electric Motor Controls I

2nd 9 WEEKS: Automated Manufacturing I

3rd 9 WEEKS: Electric Motor Controls II

4th 9 WEEKS: Automated Manufacturing II

TUESDAY - THURSDAY

1ST 9 WEEKS:
- o Tech Math 5
- o Electronics 5
- o Blueprint Reading 5

2nd 9 WEEKS:
- o Tech Math 6
- o Electronics 6
- o Blueprint Reading 6

3rd 9 WEEKS:
- o Tech Math 7
- o Electronics 7
- o Personal Computers

4th 9 WEEKS
- o Tech Math 8
- o Electronics 7
- o Tech. Report Writing

SENIOR COURSE DESCRIPTION

ELECTRIC MOTOR CONTROLS I	Fundamentals of: AC/DC electricity, AC/DC motors, interpretation of relay logic schematics, wiring of control devices and systems.
AUTOMATED MANUFACTURING I	Maintenance and troubleshooting of electrical, mechanical, and fluid power systems on industrial machines.
ELECTRIC MOTOR CONTROLS II	Fundamentals of programmable controllers, and electronic variable speed AC/DC motor controllers.
AUTOMATED MANUFACTURING II	Programming of robotic workcells, CNC work station, materials handling devices. Set-up, operation, and testing of process control simulator. Set-up, operation of computer integrated manufacturing system (CIM).
TECH MATH 5	Principles and practices of mathematical problem solving.
TECH MATH 6	Problems in fluid/electrical and mechanical machine systems.
TECH MATH 7	CNC (Computer Numerical Control) applications
TECH MATH 8	S.P.C. (Statistical Process Control) fundamentals

BLUEPRINT READING 5	Interpretation of mechanical, fluid power, and electrical schematics for industrial machine systems.
BLUEPRINT READING 6	Fundamentals of geometric dimensioning
USE OF PERSONAL COMPUTERS	Introduction to work processing for preparation of a resume.
TECHNICAL REPORT WRITING	Planning and writing of process, analytical, and examination reports
ELECTRONICS LEVEL 5	Analog Electronics
ELECTRONICS LEVEL 6	Advanced digital and operational amplifiers.
ELECTRONICS LEVEL 7	Microprocessors and machine language programming.

INDUSTRIAL AUTOMATION/ROBOTICS

LIBBEY SKILL CENTER - TOLEDO, OHIO

SENIOR - ELECTRIC MOTOR CONTROL - COURSE OUTLINE

MONDAY - WEDNESDAY - FRIDAY

WEEKS	LESSONS
1 - 1	LESSON 1 - Fundamentals of AC/DC Electricity
1 - 2	LESSON 2 - AC Power Generation and Transmission
1 - 3	LESSON 3A - Circuits, Coils, and Capacitors
1 - 4	LESSON 3B - Circuits, Coils, and Capacitors
1 - 5	LESSON 4 - Three-Phase Power Circuits
1 - 6	LESSON 5 - Reading Electrical Diagrams
1 - 7	LESSON 6 - Electrical Troubleshooting Techniques
1 - 8	LESSON 7 - Review
1 - 9	LESSON 8 - Nine Weeks Test

INDUSTRIAL AUTOMATION/ROBOTICS

LIBBEY SKILL CENTER - TOLEDO, OHIO

SENIOR - ELECTRIC MOTOR CONTROL - ACTIVITIES OUTLINE

MONDAY - WEDNESDAY - FRIDAY

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FIRST NINE WEEKS ACTIVITIES

1. **ELECTRICAL SYMBOLS AND BASIC CONTROL DIAGRAMS**

o Worksheet 2 - 1
- Worksheet 2 - 2
- Worksheet 2 - 3
- Tech - Check 2

2. **MODULE A**

- Two Wire Control Circuit
- Three Wire Control Circuit
- Multiple Station Control
- Sequence Control
- Auxiliary Contact Interlocks
- Interlocking Methods

3. **MODULE B**

- Two Wire Control Circuit
- Separate Control
- Three Wire Control
- Mechanically Held Relays
- H. O. A. Control

4. **MODULE C**

- Two Wire Control
- Three Wire Control o H. O. A. Control
- Multiple Station Control
- Jogging Control
- Jogging With a Control Relay
- Jogging Control with A Two-Position Selector Switch

5. **MODULE D**

- Two Wire Control Circuit
- Three Wire Control
- Multiple Station Control
- Jogging Control
- Jogging With a Control Relay
- Interlocking Method
- Reversing Circuit
- Reversing Control With Jogging

6. MODULE E

- Two Wire Control Circuit
- Three Wire Control Circuit
- Multiple Station Control
- Jogging Control
- Drum switch Control Circuit

INDUSTRIAL AUTOMATION/ROBOTICS

LIBBEY SKILL CENTER

TOLEDO, OHIO

SENIOR - ELECTRIC MOTOR CONTROL SCHEDULE

MONDAY - WEDNESDAY - FRIDAY

HOURS	LESSONS	ACTIVITIES
8:00 - 9:00	Dale Bill	Joe N. Steve Joe L. Jim Clyde
9:00 - 10:00	Joe N. Steve Clyde	Joe L. Dale Bill Angel Jim
10:00 - 11:00	Joe L Jim	Angel Joe N Steve Clyde
11:00 - 12:00	Angel	

ELECTRIC MOTOR CONTROL

ACTIVITIES ROTATION

STUDENTS	THREE DAYS PER STATION				
NAME	A	B	C	D	E
8:00 - 9:00					
Joe N.	1	2	3	4	5
Steve	5	1	2	3	4
Joe L.	4	5	1	2	3
Jim	3	4	5	1	2
Clyde	2	3	4	5	6
9:00 - 10:00					
Joe L.	4	5	1	2	3
Dale	1	2	3	4	5
Bill	5	1	2	3	4
Jim	3	4	5	1	2
Angel	2	3	4	5	1
10:00 - 11:00					
Joe N.	1	2	3	4	5
Steve	5	1	2	3	4
Clyde	2	3	4	5	1
Angel	4	5	1	2	3

STAFF INFORMATION

JOB DESCRIPTION CURRICULUM COORDINATOR

THIS PERSON WILL WORK FULL TIME IN THE LIBBEY INDUSTRIAL AUTOMATION PROGRAM IN CONJUNCTIONS WITH THE INSTRUCTOR AND LAB ASSISTANT TO DEVELOP COMPETENCY BASED INSTRUCTIONAL MATERIALS.

QUALIFICATIONS:

- Experience and knowledge in private/public sector initiatives.
- Experience and knowledge in educational instructional methodology, for both adults and secondary students.
- Experience in budget management of external funding between public/private sectors.
- Experienced public sector instructor/counselor.
- Experience in replicating instructional programs.
- Experience in recordkeeping and systems accountability.
- Experience in administering standardized test instruments.
- Accredited learning in the principles and practices of hydraulic systems and components

JOB DESCRIPTION FOR LAB ASSISTANT

THIS PERSON SHOULD HAVE HAD A MINIMUM OF FIVE YEARS WORKING IN AN INDUSTRIAL SETTING AS AN INDUSTRIAL AUTOMATION MAINTENANCE MECHANIC. THIS PERSON WILL WORK DIRECTLY WITH THE INDUSTRIAL AUTOMATION INSTRUCTOR.

- Working knowledge of fluid power systems and components
- Working knowledge of hand and power tools
- Working knowledge of machine shop equipment
- Working knowledge of power transmission devices
- Working knowledge of basic machine repair
- Working knowledge of electronic control devices
- Willingness to prepare and repair mechanical devices to be utilized in the instructional program
- Demonstrate ability to work independently without direct supervision
- Demonstrate ability to interact with students in positive ways

Jerry Ewig
2733 Barrington
Toledo, Ohio 43606
Telephone: (419) 531-4189 (Residence)
(419) 385-9415 (School)

Areas of Knowledge and Experience:

Industrial Maintenance Mechanic
Tool and Die Machinist
Hydraulics Specialist
Welding Fabricator

Education:

43 semester hours in Mechanical Engineering, University of Toledo
B.S. Industrial Education, Bowling Green State University, 1970
M.A. Philosophical Studies, Wittenberg University, 1967
B.A. Political Science, Carthage College, 1963
Specialized Training From Industrial Schools:
- Non-Servo Robotics Maintenance Amatrol Corporation, 1986
- Servo Robotics Maintenance Amatrol Corporation, 1986
- Weatherhead Hydralics Fittings School, Dana Technical Center, 1986
- Auto-CAD Workshop, Owens Technical College, 1986
- Vickers Industrial Hydraulics School, Vickers Corporation, 1985
- SLC100 Programmable Controller Workshop, Allen Bradley Corporation, 1985
- High Tech CNC Applications Lawrence Institute of Technology, 1985
- Optical Scanners Workshop Redline Corporation, 1984
- Boston Gear Speed Reducer School, Ohio Belting and Transmission Company, 1984
- American Foundryman's Society Training Institute, 1974
- Hobart School of Welding, 1974
- Dow Chemical Welding School, 1973
- Metrology Workshop - Bowling Green State University, 1973
- Outboard Marine Mechanic's School O.M.C. Corp., 1973
- Stress Analysis Workshop - Bowling Green State University, 1971

Certification:

Ohio Vocational Education Industrial Maintenance Instructor
Ohio Vocational Education Machine Shop Instructor
Ohio Industrial Education Technology Instructor

Jerry Ewig's Vita (continued)

Experience:

Present - 1976	Industrial Education Instructor, Toledo Public Schools. Location: Industrial Automation Maintenance Center - Libbey Skill Center
1975 - 1971	Industrial Education Instructor, Springfield Township Board of Education, Holland, Ohio.
1970 - 1968	Wacker Tool & Die - Sheet Metal Tooling Machinist
1974 - 1969	Part-time employment - Portable Welding Service Co.
1967 - 1961	Anchor Coupling Corporation Industrial Mechanic

Personal:

Born: July 14, 1941

Married

Health - Excellent

LEONA MAXINE HALL-EWIG
2733 BARRINGTON
TOLEDO, OHIO 43606
(419) 531-4189

EDUCATION

M.S. in Education, 1963, University of Oklahoma.
B.S. in Education, 1955, Central state University, Edmond, Oklahoma.

Additional Graduate Study

Trainer Validation Training, Personal and Human Growth (three credit hours), University of San Diego, San Diego, California, Summer 1986

Personal and Human Growth (six credit hours), University of San Diego, San Diego, California , Summer 1985.

Personnel and Guidance (twenty credit hours), Southwest Texas State University, San Marcus, Texas, 1973-1975.

Curriculum development in Personal Financial Management (six credit hours), University of Wisconsin, Madison, Wisconsin, 1967.

Additional Professional Training

"Introduction to Electronic Controls for Modern Hydraulic Industry" (40 instructional hours), Rexroth Corporation's School, Bethlehem, PA summer of 1988.

'Maintaining Hydraulic Components' and Systems (80 instructional hours), Rexroth Corporation's School, Auburn Hill MI summer of 1989.

"Industrial Hydraulic Maintenance", (40 instructional hours), Mid-west Fluid Power Co., Toledo, OH fall 1988.

EXPERIENCE

- 1988	Private Educational Consultant, Current clients: University of Oklahoma, Center for Drug Abuse Prevention; Midwest Fluid Power Company of Toledo, OH; New Horizons Learning System, Inc. of Toledo, OH.
1987 - 1984	Consulting and Liaison, Area Vocational School in Oklahoma; Kansas Department of Social Rehabilitation; University of Oklahoma, Center for Drug Abuse Prevention; Rose State College, Department of Technical/Occupational Education

1987 - 1982 Executive Director, Child Care Careers, Inc. at Oklahoma State University, Stillwater, Oklahoma. A cooperative program funded by The Department and Human Services, CCC Inc, Oklahoma State University and Oklahoma State Department of Vocational Education, to develop, publish and coordinate a statewide training system utilizing private sector volunteers, and to market the materials and facilitate system replication in other states.

Responsibilities: Manage the program including external fund raising, contracts, fiscal expenditures, and development of training materials. Interface between the CCC Board of Directors, the funding agency and Oklahoma Sate University. Plan and conduct training for volunteer trainers. Coordinate and facilitate training across the state, manage an office of professionals and staff. Develop and implement a marketing plans. Serve as board member of related professional organizations.

1982 - 1980 Training Specialist, Child Care Careers, Inc., Oklahoma State University , Stillwater, OK. Refined and implemented a recruitment and trainer support system for a statewide network of volunteer trainers. Planned and conducted adult workshops. Facilitated training and recognition for over 9,000 participants. Planned and implemented a data management system to track participants' ongoing training.

1980 - 1976 Assistant Director, Home Economics University Extension. Oklahoma State University, Stillwater, Oklahoma. Marketed off-campus adult education courses for both public and private sectors. Sought new audiences. Coordinated and planned conferences and specialized training with and for faculty members.

1976 - 1972 Guidance Counselor, Austin Independent School District, Austin, Texas. Coordinated services for students. Coordinated special needs student evaluations with professional staff members. Trained teaching staff through workshops. Counseled students. Modeled classroom behavior management techniques for teachers. Conducted group and individual evaluations using standardized instruments in addition to observing.

Leona Maxine Hall-Ewig's Vita (continued)

1972 - 1955 Classroom Teacher, Public Schools

STRENGTHS

- Educational Training for traditional and non-traditional audiences
- Facilitating educational programs for adults
- Management of programs
- Commitment to professional endeavors
- Team player
- High energy level

WILLIAM A URBANSKI
7964 HILL AVE.
TOLEDO, OHIO 43528

PROFESSIONAL Goal: To utilize my present skills related to automated manufacturing in an educational setting.

EDUCATION: Graduate of Springfield High School June 1976

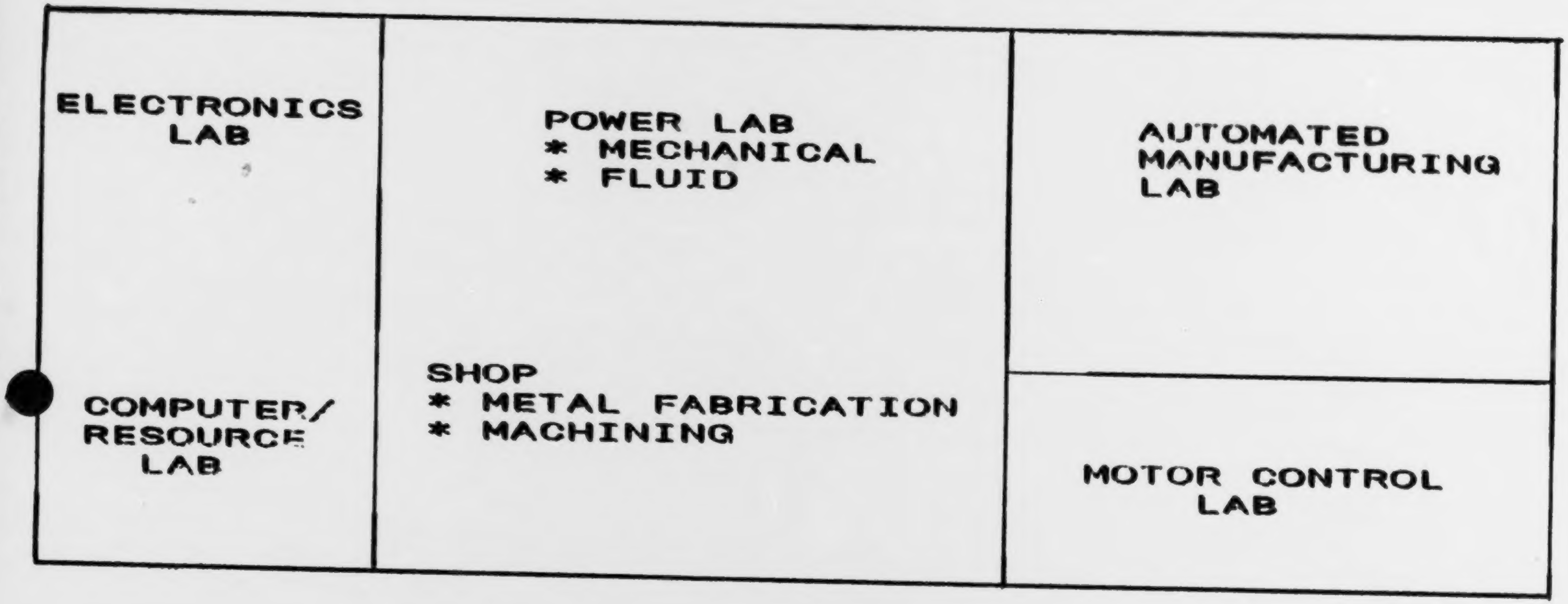
Specialized Training From Industrial Schools
- installation and adjustment of industrial bearings
- coupling devices
- speed reducers and variable speed drives

EXPERIENCE: June 1976 to February 1977, Electrician's Helper

February 1, 1977 to present Pilliod of Ohio Cabinet Company. Responsibilities during this twelve years included but were not limited to:
- production and assembly line worker
- set-up and maintenance of wet glue and heat sensitive laminators
- offset roll and silk screen printers
- automatic lacquer finishing lines
- adjustment and interfacing of electronic controls with mechanical and fluid power (pneumatic and hydraulic) transmission devices
- troubleshooting of many automated systems
- installed production machinery locally and in other Pilliod plants
- provided special services on sample and customer accounts

STATISTICS: Birthday June 2, 1958
Single Male
Health Excellent

CHARACTERISTICS: Responsible
Accept challenges
Willing worker
A student


ELECTRONICS LAB
POWER LAB
* MECHANICAL
* FLUID
AUTOMATED MANUFACTURING LAB
COMPUTER/ RESOURCE LAB
SHOP
* METAL FABRICATION
* MACHINING
MOTOR CONTROL LAB

INDUSTRIAL AUTOMATION LAB

FLOOR PLAN

BASIC EQUIPMENT LIST

ELECTRONICS LAB - 14 STATIONS

- ANALOG & DIGITAL TRAINERS
- INSTRUMENTATION

COMPUTER/RESOURCE LAB - 5 COMPUTERS
4 VCR's

POWER LAB - MECHANICAL (6 WORKSTATIONS)

- BEARING
- BELTS/CHAINS
- CLUTCHES/BRAKES
- COUPLING ALIGNMENT
- FASTENERS
- GEARS/SPEED REDUCERS

- FLUID - HYDRAULIC (9 WORKSTATIONS)

- CIRCUIT TRAINERS
- PUMP TEST STAND
- PUMP WORK STATION
- VALVE TEST STAND
- VALVE WORK STATION
- HOSE ASSEMBLY STATION
- TUBE LINE FABRICATION STATION

- PNEUMATIC (3 WORKSTATIONS)

- VALVE WORK STATION
- ACTUATOR WORK STATION
- CIRCUIT TRAINER

SHOP - METAL FABRICATION

- * SHIELDED METAL ARC WELDING MACHINES (3)
- * MIG MACHINES (3)
- * TIG MACHINE
- * OXY-ACETYLENE STATIONS (2)
- * SHEET METAL BRAKES/BENDERS/NOTCHERS

- MACHINING

- * 6 LATHES
- * 2 MILLS (VERTICAL, HORIZONTAL)
- * 1 SURFACE GRINDER
- * 2 BANDSAWS (VERTICAL, HORIZONTAL)
- * 1 DRILL PRESS

AUTOMATED MANUFACTURING LAB

INDUSTRIAL MACHINES**

- * INJECTION MOLDING**
- * PUNCHING**
- * THREAD ROLLING**
- * INDEXING**
- * ROBOTIC WORKCELLS (3)
- * CIM SYSTEM

** DONATED BY LOCAL INDUSTRY

MOTOR CONTROL LAB

- * WIRING STATIONS (12)
- * AC/DC VARIABLE SPEED DRIVES
- * PROGRAMMABLE CONTROLLERS (9)

THE OHIO STATE UNIVERSITY

Vocational Instructional Materials Laboratory

1900 Kenny Road
Columbus, OH 43210-1016
614-292-5001

EVALUATION REPORT FOR INDUSTRIAL AUTOMATION MAINTENANCE PROJECT

Libbey High School
Toledo, Ohio

Evaluator

Joyce M. Leimbach
The Ohio State University

PROJECT: INDUSTRIAL AUTOMATION MAINTENANCE PROGRAM

PROJECT EVALUATOR: JOYCE M. LEIMBACH
The Ohio State University
Instructional Materials Laboratory

QUALIFICATIONS:

- Ten years experience as Curriculum Consultant at the Ohio state University, College of Education; previously taught twelve years in secondary vocational classroom.

- Works closely with the Ohio Department of Education, Division of Vocational and Career Education.

- Developed numerous curriculum documents for the State of Ohio

  Auto Mechanics Lab Management Guide
  Carpentry Lab Management Guide
  Electronics Lab Management Guide
  Electricity Lab Management Guide
  Building Maintenance Lab Management Guide
  Welding Lab Management Guide
  Graphic Arts Lab Management Guide
  Nurse Assistant Curriculum Guide
  Curriculum Guide for Licensed Practical Nurses
  Series of student materials for Ohio's Occupational Work Experience Programs
  Numerous publications for public safety services

- Co-author National VICA Professional Development Program for all Vocational education students

- Primary author National VICA Professional development Program for Automotive Technicians

- Authored numerous other publications for National VICA

- Currently involved in curriculum development for Ohio's Future At Work; the plan to accelerate vocational education in Ohio

- Serves at Ohio's state representative to the National Network for Curriculum Coordination in Vocational and Technical Education

The object of the initial visit to Libbey High School in Toledo was to become familiar with the Industrial Automation Maintenance Project, and to become acquainted with the curriculum consultant and the program instructor. The Project Director, John Burkhart, had contacted me to evaluate the project at a professional conference early in 1989. At the initial visit, the director, curriculum consultant, and instructor reviewed the program objectives, established dates for on-site reviews, and discussed the proposed progression of activities to the closure of the project.

In addition, a tour was taken of the facilities to learn about the equipment components, the tools and materials acquired, the individual learning stations, and to ascertain an overview of the laboratory management system. The process of the curriculum research and literature review was explained by the consultant. She had gathered numerous documents, samples of video presentations, etc. to review for their applicability to the proposed curriculum for cross-training. This was done in avery comprehensive manner.

The course outline was reviewed along with realistic timeliness for the indepth development process. It was obvious all three participants were knowledgeable of what was needed to meet the objectives. A concern was expressed for the timeline regarding completion of the two-year curriculum package.

The initial visit was followed by a second on-site visit in April 1990. To actually review the individual learning activity packet (LAP) content as proposed and discuss exactly where the consultant was with regard to the junior-year curriculum. The organization of the physical facilities in the learning laboratory was exemplary. At this point I expressed a concern that the LAPS for the junior year would be completed.

After the second visit I met with the Project Director and expressed my concerns. I was in constant phone contact with Mr. Burkhart and we also frequently attended the same professional conferences.

In July 1990 I revisited the program and a significant gain was noticeable with regard to continued development of the individual LAPS and strategies had been identified for implementation of the program. At this point 80% of the milling LAPS, 50% of the power transmission LAPS, 75% of the welding LAPS, and 50% of the fluid power LAPS were completed. We discussed the rationale for the program and how the program fits into Ohio's plan to accelerate the modernization for vocational education.

We also discussed implementation strategies that would help future vocational administrators implement the program. The consultant and instructor both expressed concern for developing a fair evaluation program for the individual student. As Ohio's representative to the National Curriculum Network I was able to provide sample evaluation instruments and rating sheets from other states.

A follow-up phone conference was held with the Project Director to share observations.

In August 1990 I revisited the program and was pleasantly surprised to find most of the materials in place. A word processing operator was assisting with completion of the final document. Again, the laboratory was in exemplary condition as it was being prepared for the coming school year.

In September 1990 I made a final visit to the program to review the final content of the project as it was drawing to closure. At this meeting I suggested the following items to be included in the final document: a generic equipment list with estimated costs, an estimated timeframe for program setup and implementation, a complete task list for the two-year curriculum, a list of all resources (with sources listed), a list of job titles for graduates; implementation and management strategies, a student profile for the average student in the program, and a narrative of the importance of the management of the systems approach used in the program at Libbey High School.

Approximately 33 LPAS have been completed in the following areas: power and fluid transmission, machining, and fabrication, with additional materials for electronics.

To summarize the monitoring evaluation, I conclude the amount of materials developed for the project in the timeframe allowed, is extensive. It is my opinion that Maxine Hall, the project consultant and Jerry Ewig, the program instructor have drawn the project to closure in a comprehensive manner. At the exit on-site visit a tour of the facilities presented a learning laboratory that is outstanding for student learning.

At the September visit I observed students entering the program facilities with a positive attitude ready to proceed with learning. They greeted the instructor and proceeded to take charge of their assignments. Mr. Ewig commented that he noted an awareness of change in teaching/learning styles, i.e. transferring from the traditional structure of classroom lecture/demonstration to the use of individual learning activity packets, was critical to the success of the program. Students slowly evolve into a self-responsibility mode and take charge of their own learning activities. This concept is different for most instructors in Ohio's educational facilities.

SUGGESTIONS FOR REPLICATING THE INDUSTRIAL AUTOMATION MAINTENANCE PROGRAM

The pilot project of the Industrial Maintenance Program at Libbey High School in Toledo, Ohio addresses some major changes and challenges as presented in Ohio's action plan for accelerating vocational education (8/90). It presents opportunities for graduates to learn competencies that broaden the scope of vision in maintaining and operating industrial equipment and meet the changing demands in the industrial arena. It is likely the program would be most successful in a school setting where administrators and counselors became involved with promotion of the program and the pool of students eligible to enroll included a majority of better-than-average ability. The highly-motivated student with a concern for his or her future will benefit the most from this type of cross-training.

The curriculum provides an opportunity for displaced workers or workers in need of upgrading and retraining, to return to the learning laboratory for continued lifelong learning to maintain pace with the changing workplace. It allows for graduates to become knowledgeable in several occupational areas. Core competencies are critical to student job success; however, many occupationally-transferable skills enrich the total curriculum.

The program will be most successful and productive in facilities that have been newly-planned and constructed; however, as vocational programs are phased out (lack of enrollment, lack of resources, etc.), an existing learning laboratory can be remodeled and/or modified to fit the need.

Since the majority of the related-theory learning is via individual LAPS it is very important that the area set aside to house the learning carols, audio visuals, and materials be somewhat soundproof to provide an uninterrupted learning environment. If only one instructor is employed it is recommended that a glass viewing window be installed between the theory room and the learning laboratory with the major equipment to diminish the noise and provide a clean classroom setting.

It is suggested that a lab assistant be provided in the learning laboratory with one instructor teaching the total curriculum. Due to the wide variety of tasks addressed in the program and the logistics of the learning laboratory layout, an assistant is a valuable asset to ensure the safety of the students, reduce liability for the school, and enhance learning. An assistant would be especially helpful in a program with open entry/exit. The ideal assistant would be a recent graduate who may be furthering his or her education, and have a need for extra resources and a flexible time schedule. The assistant must be proficient in the core competencies.

APPENDIX II

FLUID AND MECHANICAL POWER TRANSMISSION LEARNING ACTIVITY PACKETS

FLUID POWER

TUBE LINE FABRICATION

PNEUMATICS

HYDRAULIC PUMPS

HYDRAULIC VALVES

ACTUATORS

HYDRAULIC CIRCUITS

MECHANICAL POWER

BEARINGS

CLUTCHES AND BRAKES

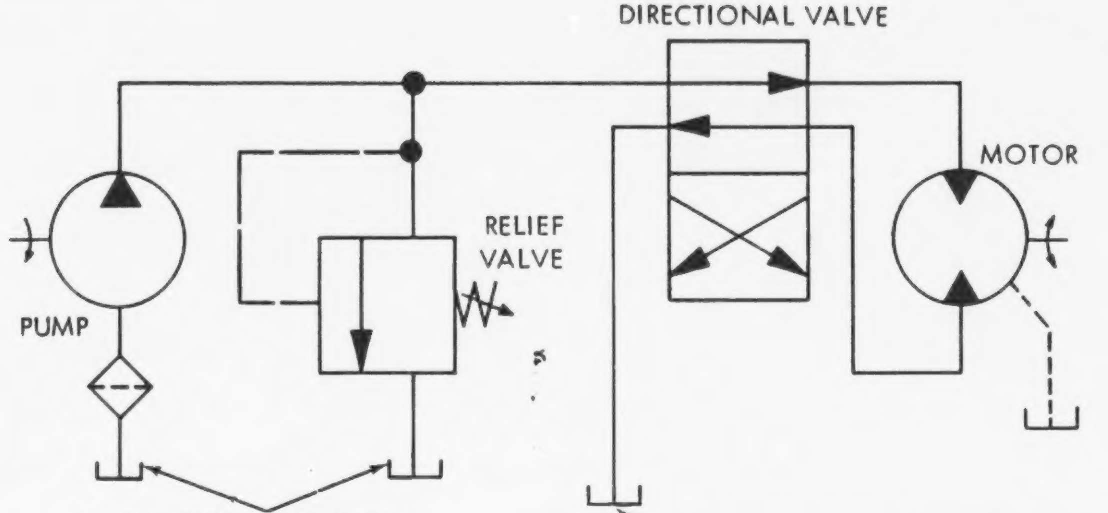
COUPLINGS

FASTENERS

GEARS

V-BELTS AND CHAINS

FLUID POWER


DIRECTIONAL VALVE
MOTOR
RELIEF
VALVE
PUMP

1. THE RESERVOIR MAY BE DRAWN AS MANY TIMES AS CONVENIENCE DICTATES.

2. A LINE WHICH TERMINATES BELOW THE FLUID LEVEL IS DRAWN TO THE BOTTOM OF THE SYMBOL.

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – FLUID POWER LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	FLUID POWER
LAP TITLE	SAFETY AND TOOL IDENTIFICATION

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to pass a safety test with 100% accuracy and identify tools and their locations. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

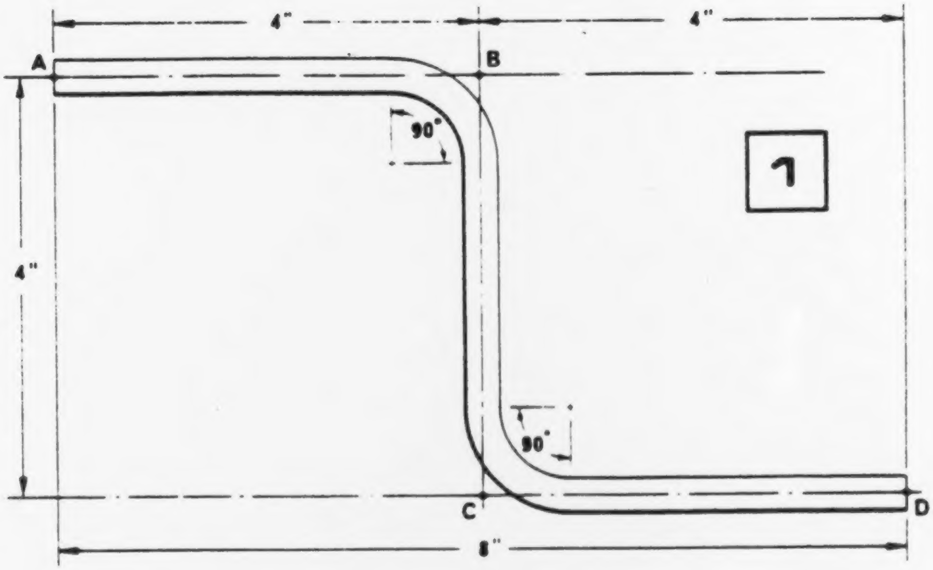
TASK Pass Safety Test with 100% accuracy and identify tools and their locations

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-0	None	2 Hours

FLUID POWER
TUBE LINE FABRICATION


4"
4"
A
B
90°
1
4"
90°
C
D
8"

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – T L F LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	TUBE LINE FABRICATION
LAP TITLE	LAYOUT

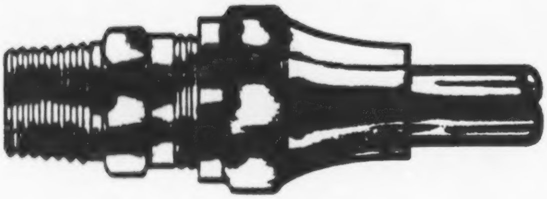
PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely layout and bend tubing to specifications. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

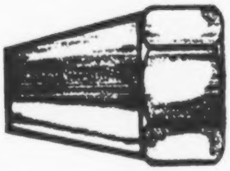
TASK Layout and bend tubing to specifications

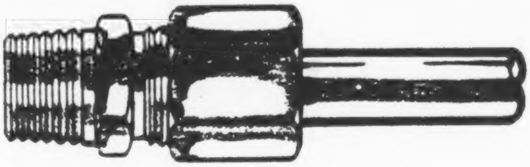
REFERENCES
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

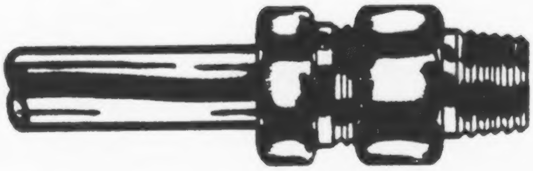
LAP #	Prerequisites	Time Range
FP-TLF #	FP-0	3 Hours

FLUID POWER TUBE LINE FABRICATION









INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - T L F LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	TUBE LINE FABRICATION
LAP TITLE	FITTINGS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to identify and measure various types of fittings commonly used with tubing. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

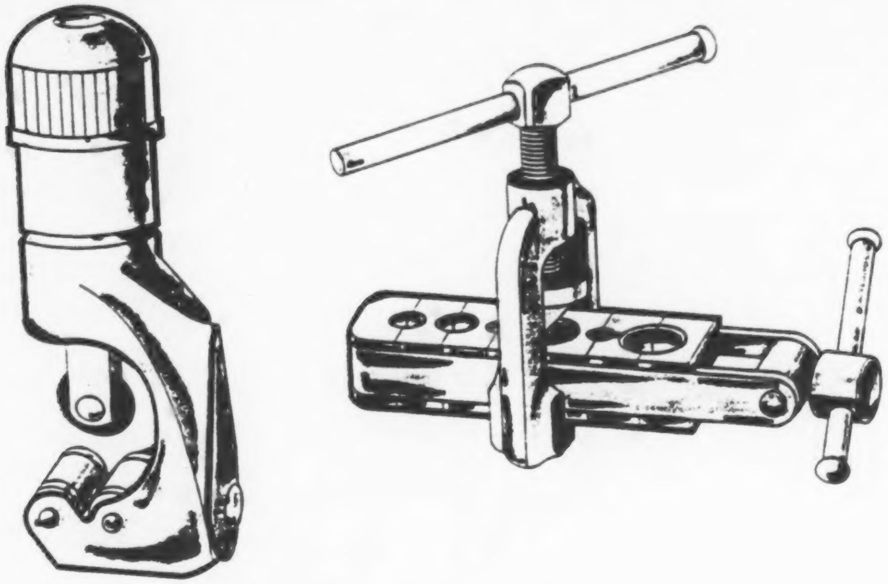
TASK Identify and measure various types of fittings commonly used with tubing

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-TLF # 2	FP-TLF 1	3 Hours

FLUID POWER
TUBE LINE FABRICATION



LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - T L F LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	TUBE LINE FABRICATION
LAP TITLE	TUBING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely cut, flare, and fit tube to fittings. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Cut, flare, and fit tube to fittings

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.

Fest. Hydraulic Workbook. Festo-didactic. New York, NY.

Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.

Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.

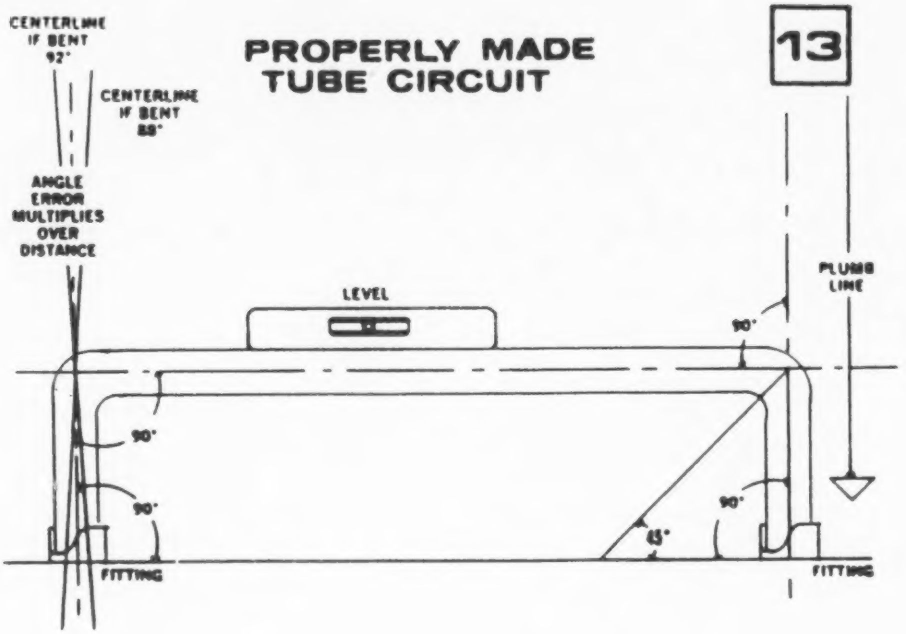
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.

Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.

Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-TLF # 3	FP-TLF 1 - 2	3 Hours

FLUID POWER
TUBE LINE FABRICATION


PROPERLY MADE TUBE CIRCUIT

13
CENTERLINE IF BENT 92°
CENTERLINE IF BENT 88°
ANGLE ERROR MULTIPLIES OVER DISTANCE
LEVEL
90°
90°
90°
90°
90°
45°
PLUMB LINE
FITTING
FITTING

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - T L F LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	TUBE LINE FABRICATION
LAP TITLE	INSTALL AND TEST TUBING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely install and test tubing fabrication to pneumatic power supply. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Install and test tubing fabrication to pneumatic power supply

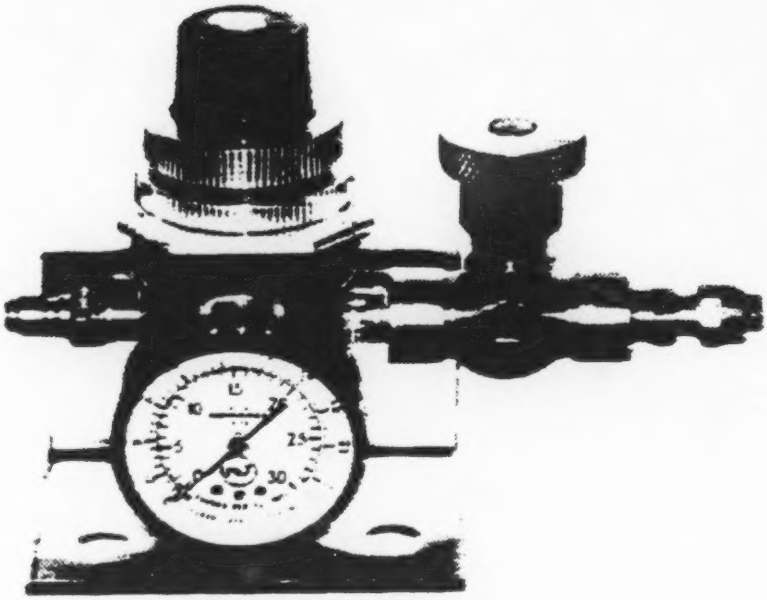
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-TLF # 4	FP-TLF 1 - 3	3 Hours

FLUID POWER

PNEUMATICS


15
10
20
5
25
0
30

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	FILTER REGULATOR AND LUBRICATION

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to disassemble, inspect, and assemble filter regulator and lubricator units. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

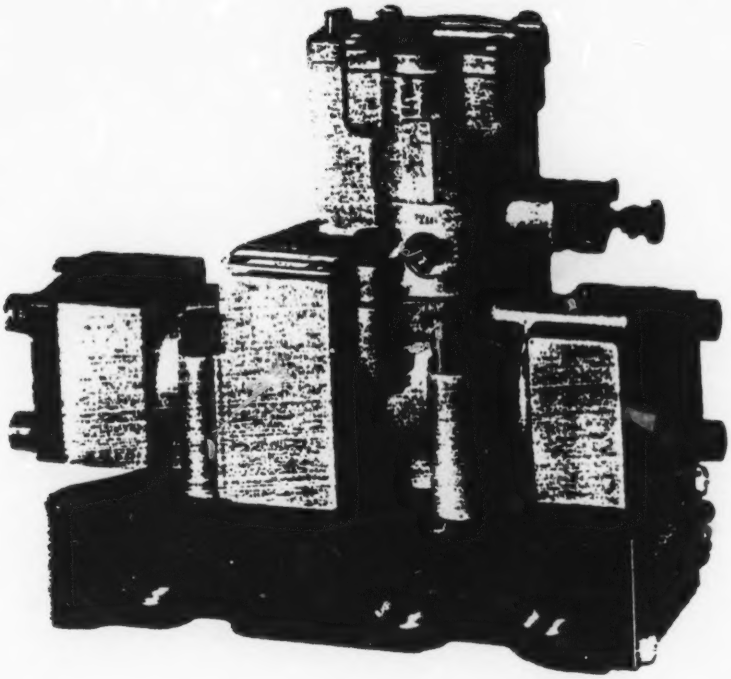
TASK Disassemble, inspect, and assemble filter regulator and lubricator units

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 1	FP-0	3 Hours

PNEUMATICS



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	DIRECTIONAL CONTROL VALVE

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and assemble a pneumatic directional control valve. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, and assemble a pneumatic directional control valve

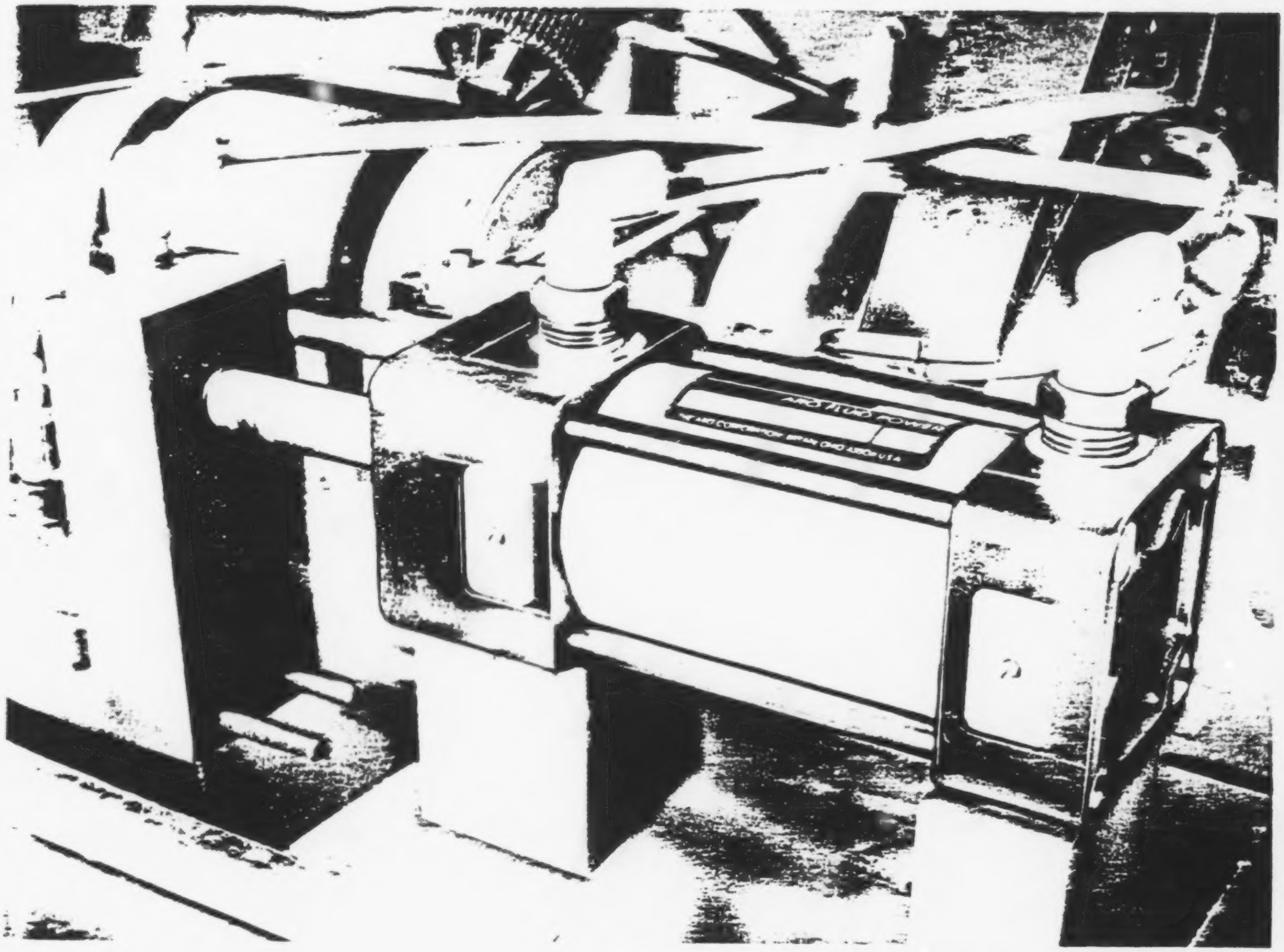
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 2	FP-0, FP-PN 1	3 Hours

FLUID POWER

PNEUMATICS


ARO FLUID POWER

84

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	CYLINDERS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and assemble a pneumatic cylinder. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, and assemble a pneumatic cylinder

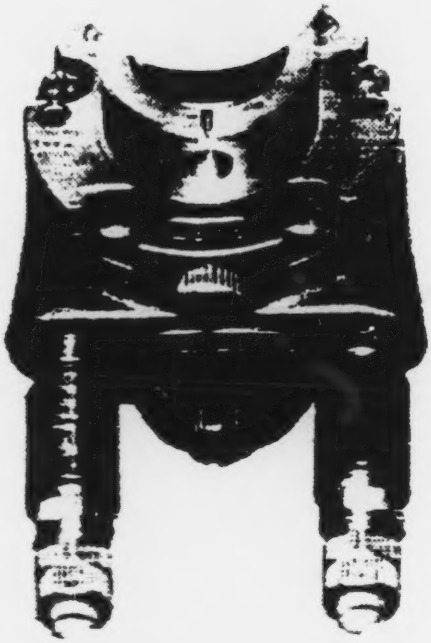
REFERENCES

ARO. *Fluid Power Text*. The ARO Corp. Bryan, OH.
Fest. *Hydraulic Workbook*. Festo-didactic. New York, NY.
Parker Training Dept. *Industrial Hydraulic Technology*. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. *fluid Power Designers Lightening Reference Handbook*. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. *Basic Fluid Power*. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. *Industrial Hydraulics Manual*. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. *Understanding Hose & Fittings Service Guide*. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 3	FP-0, FP-PN 0-2	3 Hours

FLUID POWER

PNEUMATICS



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	MOTORS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and assemble a pneumatic motor. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, and assemble a pneumatic motor

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.

Fest. Hydraulic Workbook. Festo-didactic. New York, NY.

Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.

Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.

Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.

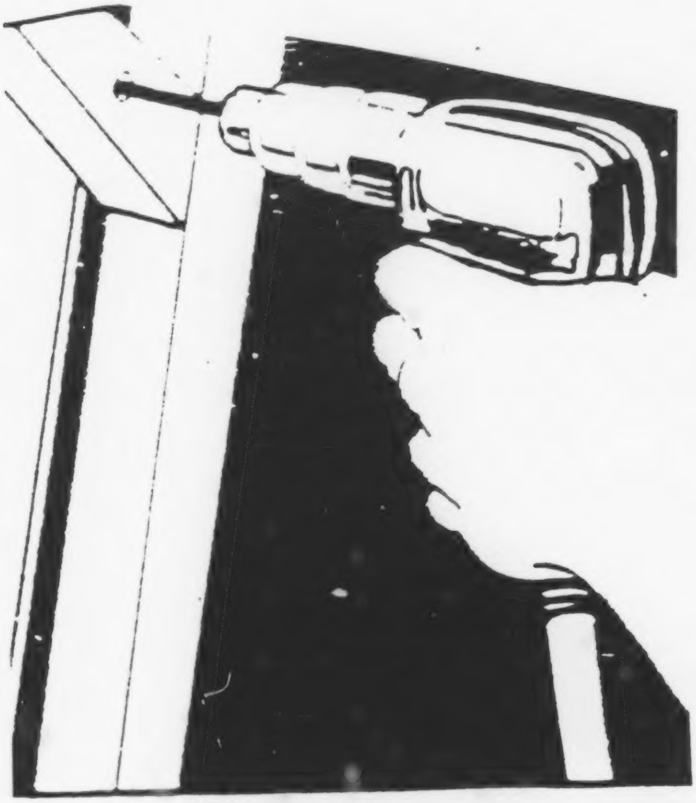
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.

Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 4	FP-0, FP-PN 0-3	3 Hours

FLUID POWER

PNEUMATICS



LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	HAND TOOLS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and assemble a pneumatic hand tool. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, and assemble a pneumatic hand tool

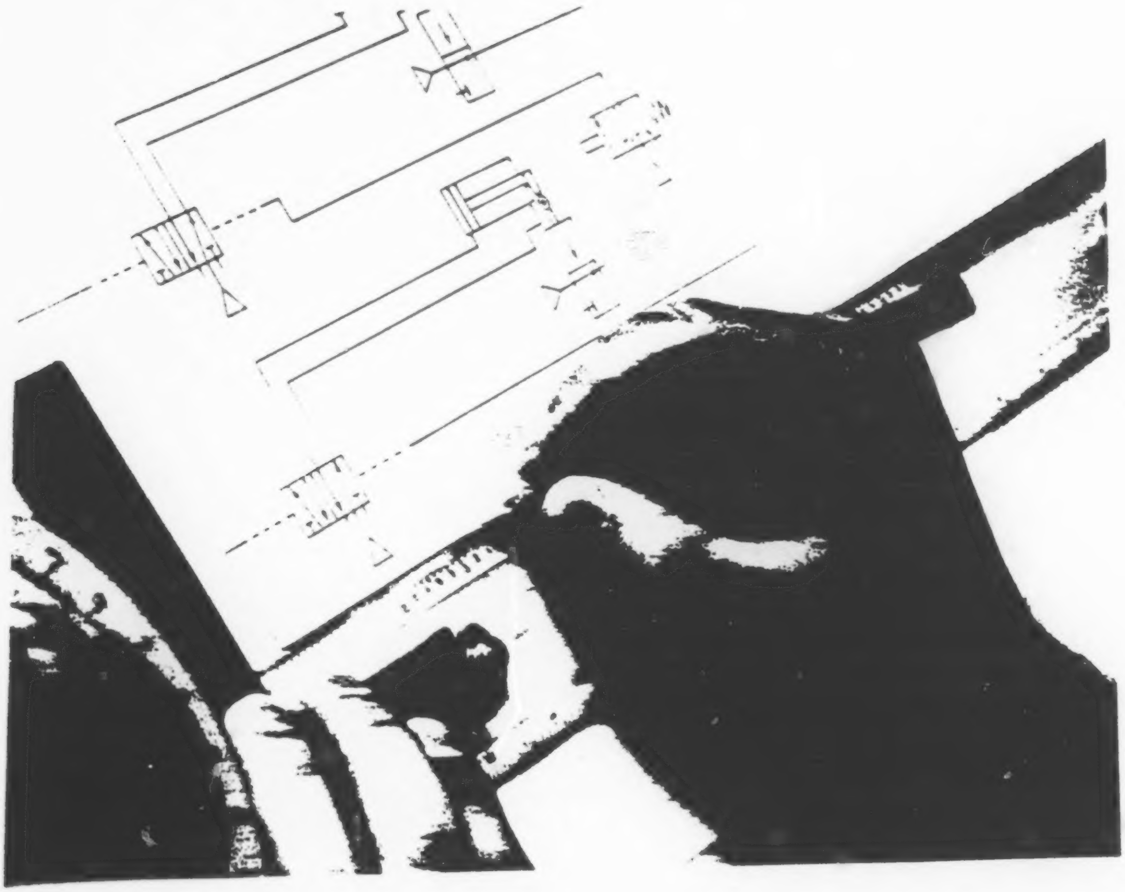
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 5	FP-0, FP-PN 0-4	3 Hours

FLUID POWER

PNEUMATICS



LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – PNEUMATICS LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	PNEUMATICS
LAP TITLE	TROUBLESHOOTING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely assemble, verify, and troubleshoot an air logic system. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

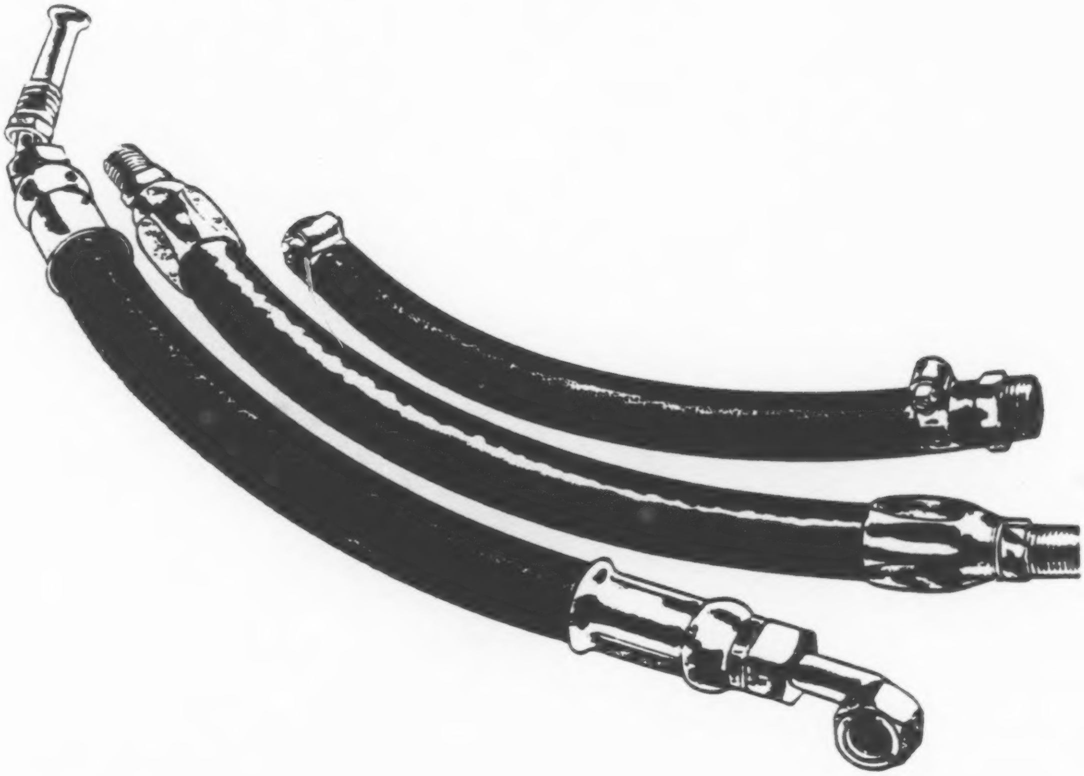
TASK Assemble, verify, and troubleshoot an air logic system

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-PN # 6	FP-0, FP-PN 0-5	3 Hours

FLUID POWER
HYDRAULIC HOSE ASSEMBLY



LAP #1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - H HOSE ASSEMBLY LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC HOSE ASSEMBLY
LAP TITLE	IDENTIFY AND MEASURE HOSE

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to identify and measure various types of hose ends used in hydraulic systems. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Identify and measure various types of hose ends used in hydraulic systems

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.

Fest. Hydraulic Workbook. Festo-didactic. New York, NY.

Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.

Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.

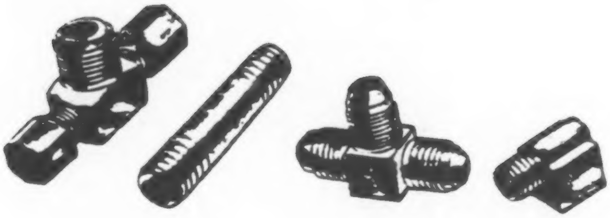
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.

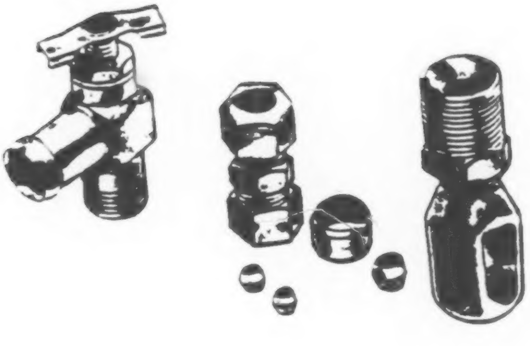
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.

Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HHA # 1	FP-0	3 Hours

FLUID POWER
HYDRAULIC HOSE ASSEMBLY





INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - H HOSE ASSEMBLY LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC HOSE ASSEMBLY
LAP TITLE	IDENTIFY AND MEASURE FITTINGS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to identify and measure various types of fittings used in hydraulic systems. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

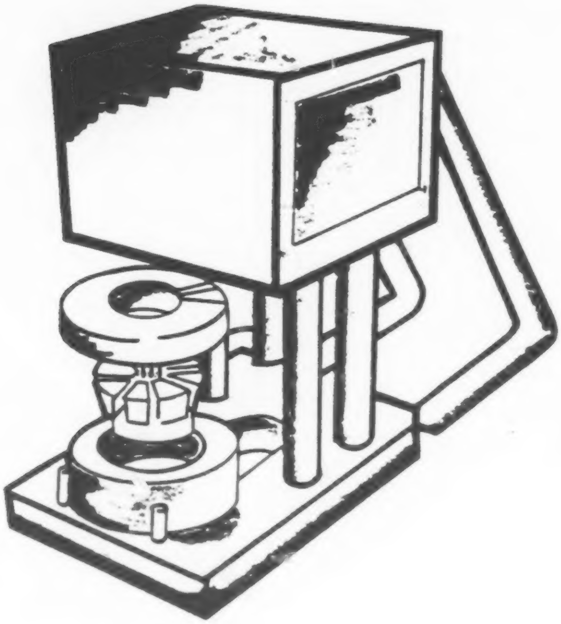
TASK Identify and measure various types of fittings used in hydraulic systems

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HHA # 2	FP-HHA 1	3 Hours

FLUID POWER
HYDRAULIC HOSE ASSEMBLY



LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – H HOSE ASSEMBLY LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC HOSE ASSEMBLY
LAP TITLE	HOSE CRIMPING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely crimp hose ends and fittings on hydraulic hose. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Crimp hose ends and fittings on hydraulic hose

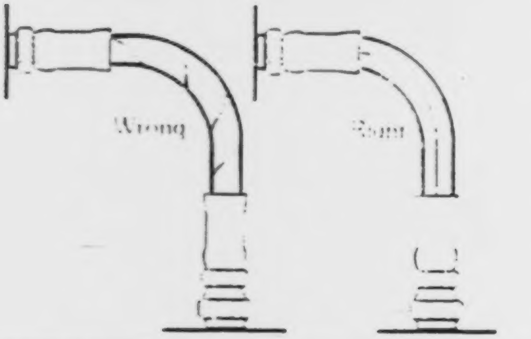
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

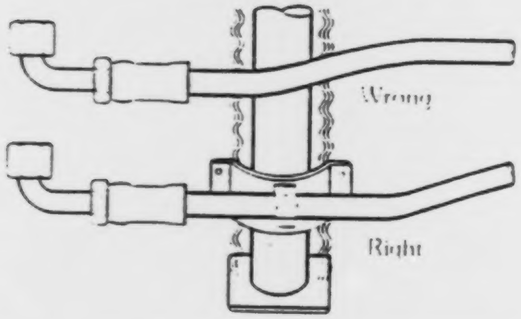
LAP #	Prerequisites	Time Range
FP-HHA # 3	FP-HHA 1 - 2	3 Hours

FLUID POWER
HYDRAULIC HOSE ASSEMBLY

Avoid Twisting


Wrong
Right

Protect from Hazardous Environment


Wrong
Right

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – H HOSE ASSEMBLY LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC HOSE ASSEMBLY
LAP TITLE	INSTALL HOSE ASSEMBLY

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely install and test hose assembly on hydraulic power. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

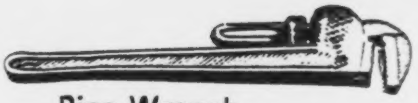
TASK Install and test hose assembly on hydraulic power

REFERENCES

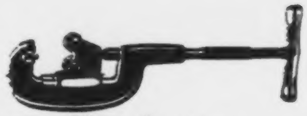
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HHA # 4	FP-HHA 1 - 3	3 Hours

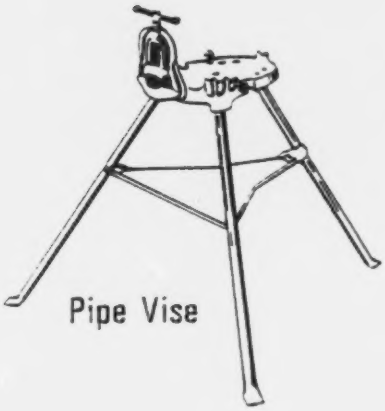
FLUID POWER
HYDRAULIC HOSE ASSEMBLY



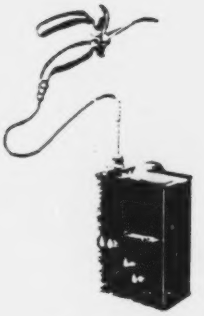
Pipe Wrench



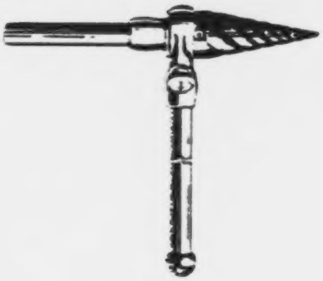
Pipe Cutter



Pipe Vise

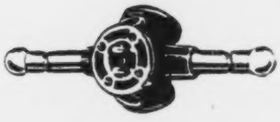


Cutting Fluid

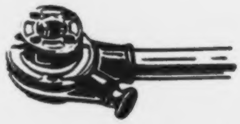


Pipe Reamer

Pipe Threaders



3-Way



Drop Head Ratchet

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - H HOSE ASSEMBLY LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA FLUID POWER

INSTRUCTIONAL UNIT HYDRAULIC HOSE ASSEMBLY

LAP TITLE PIPE FITTING

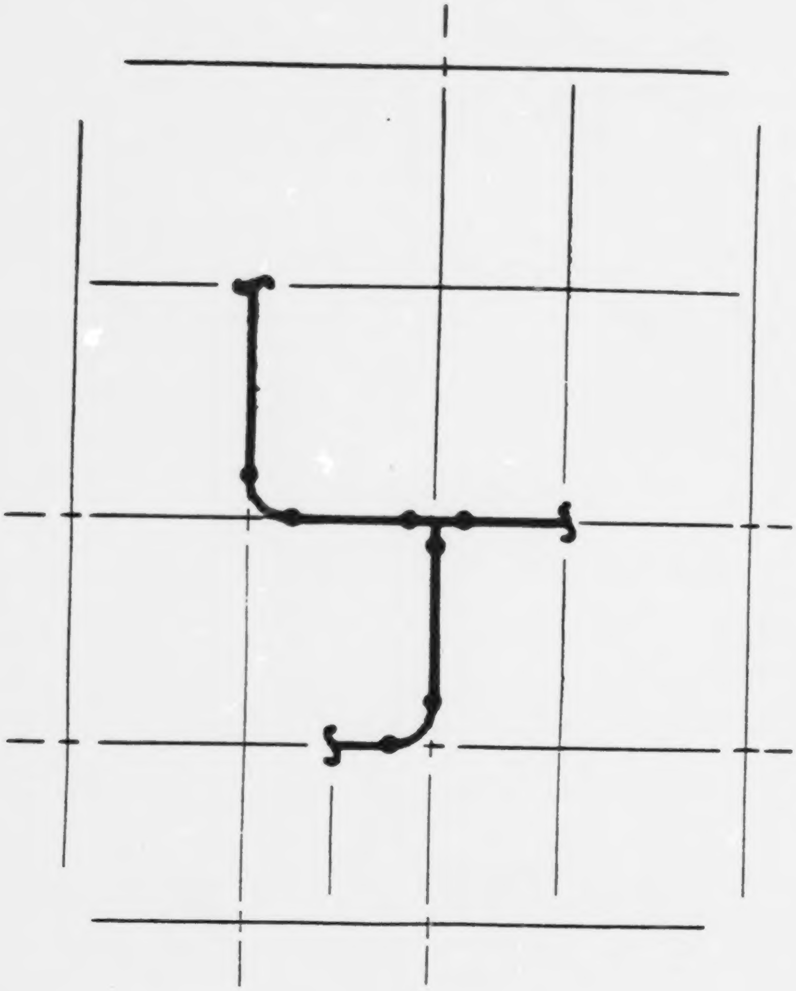
PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely cut, thread, and fit pipe. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Cut, thread, and fit pipe

REFERENCES
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HHA # 5	FP-HHA 1 - 4	3 Hours

FLUID POWER
HYDRAULIC HOSE ASSEMBLY



LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – H HOSE ASSEMBLY LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC HOSE ASSEMBLY
LAP TITLE	INSTALLING HOSE ASSEMBLY

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely install pipe assembly according to schematic. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

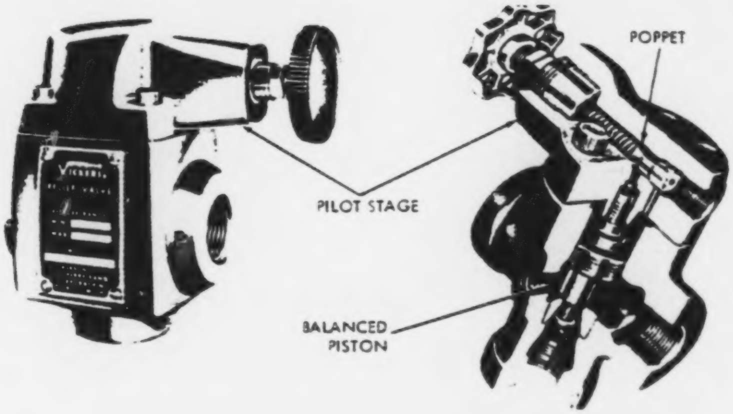
TASK Install pipe assembly according to schematic

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HHA # 6	FP-HHA 1 - 5	3 Hours

FLUID POWER
HYDRAULIC VALVES


POPPET
PILOT STAGE
BALANCED PISTON

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER-HYDRAULIC VALVES LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC VALVES
LAP TITLE	PRESSURE CONTROL VALVES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, assemble, and test pressure control valves. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, assemble, and test pressure control valves

REFERENCES
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HV # 1	FP-0	3 Hours

FLUID POWER
HYDRAULIC VALVES

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC VALVES LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC VALVES
LAP TITLE	FLOW CONTROL VALVES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, assemble, and test flow control valves. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

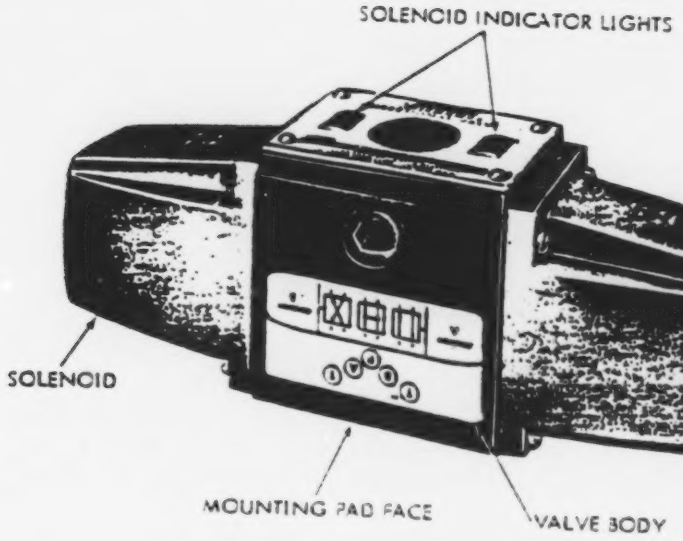
TASK Disassemble, inspect, assemble, and test flow control valves

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HV # 2	FP-HV 1	3 Hours

FLUID POWER
HYDRAULIC VALVES


SOLENOID INDICATOR LIGHTS
SOLENOID
MOUNTING PAD FACE
VALVE BODY

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER-HYDRAULIC VALVES LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC VALVES
LAP TITLE	DIRECTIONAL CONTROL VALVES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, assemble, and test directional control valves. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, assemble, and test directional control valves

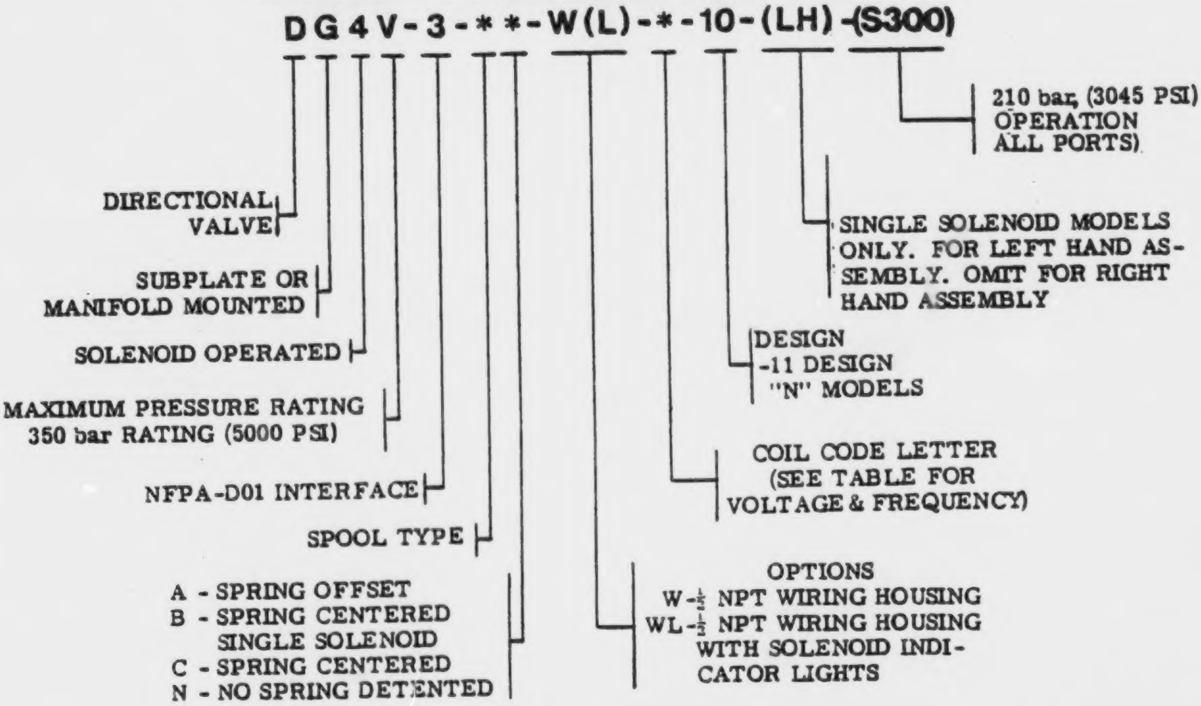
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HV # 3	FP-HV 1 - 2	3 Hours

FLUID POWER
HYDRAULIC VALVES

MODEL CODE BREAKDOWN



DG4V-3-**-W(L)-*-10-(LH)-(S300)

DIRECTIONAL VALVE

SUBPLATE OR MANIFOLD MOUNTED

SOLENOID OPERATED

MAXIMUM PRESSURE RATING 350 bar RATING (5000 PSI)

NFPA-D01 INTERFACE

SPOOL TYPE

A - SPRING OFFSET
B - SPRING CENTERED SINGLE SOLENOID
C - SPRING CENTERED
N - NO SPRING DETENTED

OPTIONS
W-½ NPT WIRING HOUSING
WL-½ NPT WIRING HOUSING WITH SOLENOID INDICATOR LIGHTS

COIL CODE LETTER (SEE TABLE FOR VOLTAGE & FREQUENCY)

DESIGN
-11 DESIGN "N" MODELS

SINGLE SOLENOID MODELS ONLY. FOR LEFT HAND ASSEMBLY. OMIT FOR RIGHT HAND ASSEMBLY

210 bar, (3045 PSI) OPERATION ALL PORTS)

NOTE: (F3) VITON SEALS ARE STANDARD IN THIS UNIT.

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC VALVES LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC VALVES
LAP TITLE	REPLACEMENT PARTS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely locate necessary information for ordering replacement parts given a defective hydraulic valve. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

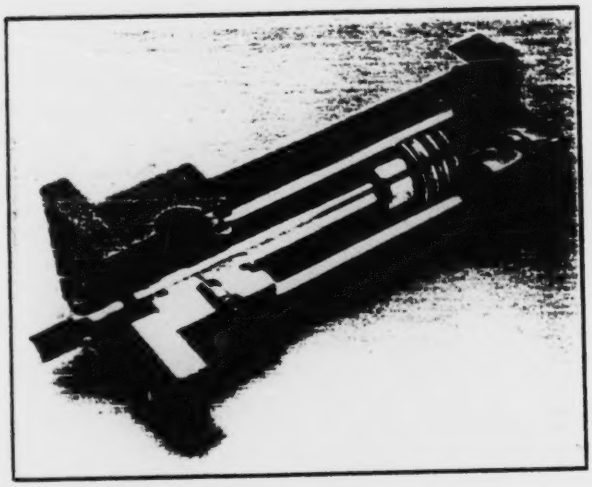
TASK Given a defective hydraulic valve, locate necessary information for ordering replacement parts

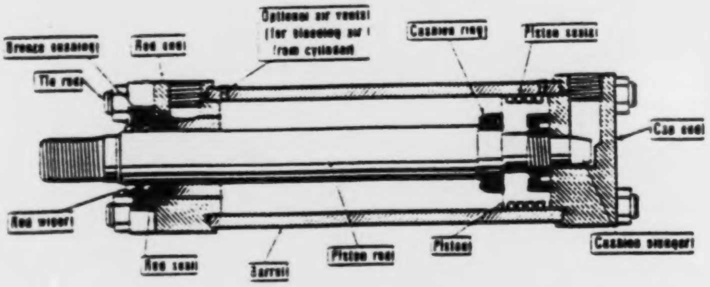
REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HV # 4	FP-HV 1 - 3	3 Hours

FLUID POWER ACTUATORS




Bronze bushing
Rod seal
Optional air vents (for bleeding air from cylinder)
Cushion ring
Piston seals
Tie rods
Cap seal
Rod wiper
Rod seal
Barrel
Piston rod
Piston
Cushion sleeve

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – ACTUATORS LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	ACTUATORS
LAP TITLE	CYLINDER

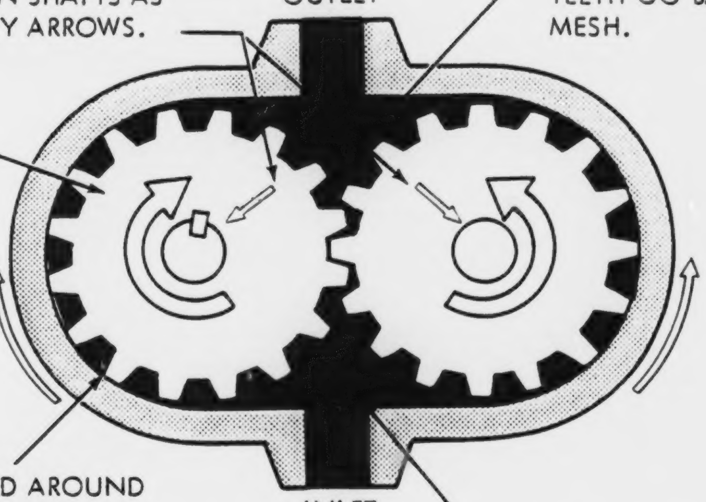
PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and reassemble a hydraulic cylinder. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Disassemble, inspect, and reassemble a hydraulic cylinder

REFERENCES
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-A # 1	FP # 0	3 Hours

FLUID POWER
HYDRAULIC PUMPS



4. OUTLET PRESSURE AGAINST TEETH CAUSES HEAVY SIDE-LOADING ON SHAFTS AS INDICATED BY ARROWS.

3. AND FORCED OUT OF PRESSURE PORT AS TEETH GO BACK INTO MESH.

2. OIL IS CARRIED AROUND HOUSING IN CHAMBERS FORMED BETWEEN TEETH, HOUSING AND SIDE PLATES...

1. VACUUM IS CREATED HERE AS TEETH UNMESH. OIL ENTERS FROM RESERVOIR.

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC PUMPS LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC PUMPS
LAP TITLE	GEAR PUMPS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and reassemble a gear pump. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

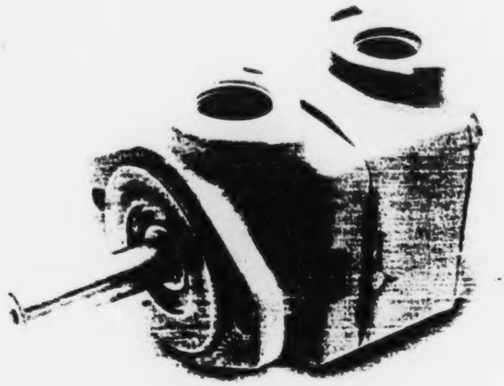
TASK Disassemble, inspect, and reassemble a gear pump

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HP # 1	FP-0	3 Hours

FLUID POWER
HYDRAULIC PUMPS



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – HYDRAULIC PUMPS LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC PUMPS
LAP TITLE	VANE PUMPS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and reassemble a vane pump. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

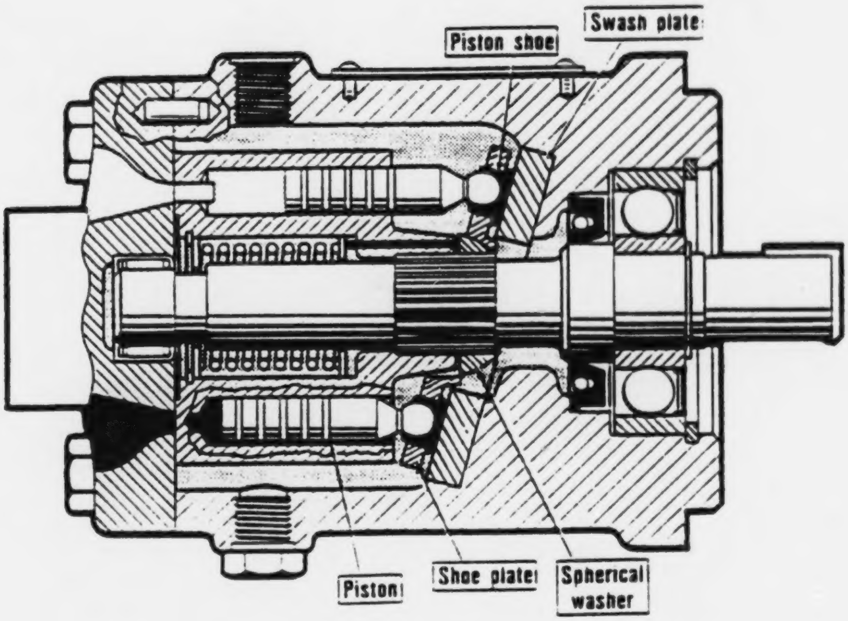
TASK Disassemble, inspect, and reassemble a vane pump

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HP # 2	FP-HP 0-1	3 Hours

FLUID POWER
HYDRAULIC PUMPS


Swash plate
Piston shoe
Piston
Shoe plate
Spherical washer

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER – HYDRAULIC PUMPS LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC PUMPS
LAP TITLE	PISTON PUMPS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely disassemble, inspect, and reassemble a piston pump. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

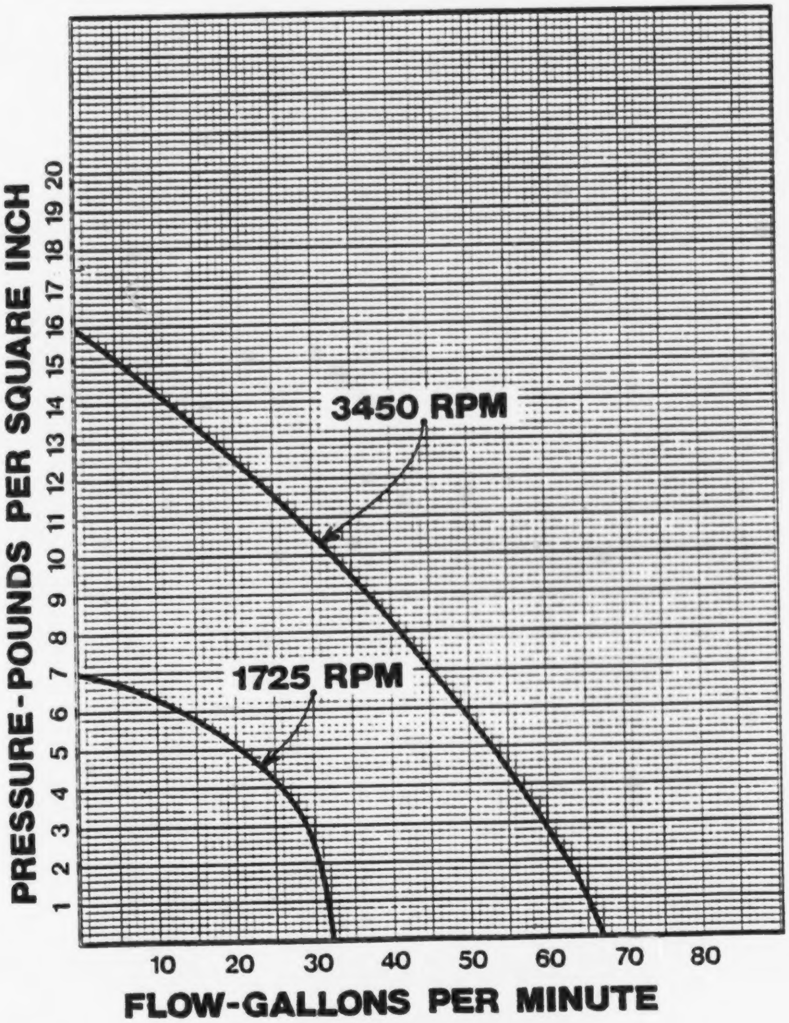
TASK Disassemble, inspect, and reassemble a piston pump

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HP # 3	FP-HP 0-2	3 Hours

FLUID POWER
HYDRAULIC PUMPS



PUMP CURVE

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER - HYDRAULIC PUMPS LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA FLUID POWER

INSTRUCTIONAL UNIT HYDRAULIC PUMPS

LAP TITLE [illegible] TEST

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely test vane pump for mechanical and volumetric efficiency. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

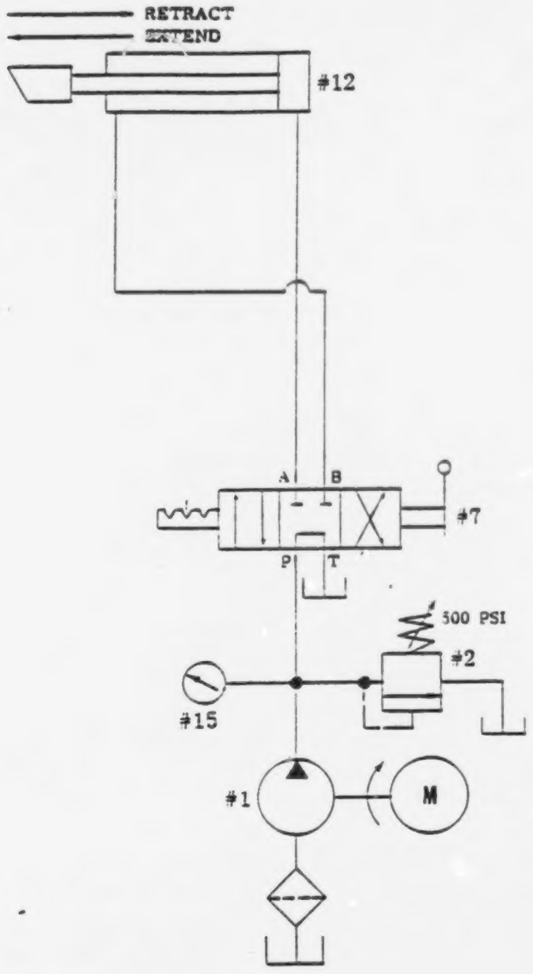
TASK Test vane pump for mechanical and volumetric efficiency

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HP # 4	FP-0, FP-HP 0-3	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


RETRACT
EXTEND
#12
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP #

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	LINEAR CIRCUITS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate basic linear hydraulic circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Demonstrate basic linear hydraulic circuit

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.

Fest. Hydraulic Workbook. Festo-didactic. New York, NY.

Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.

Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.

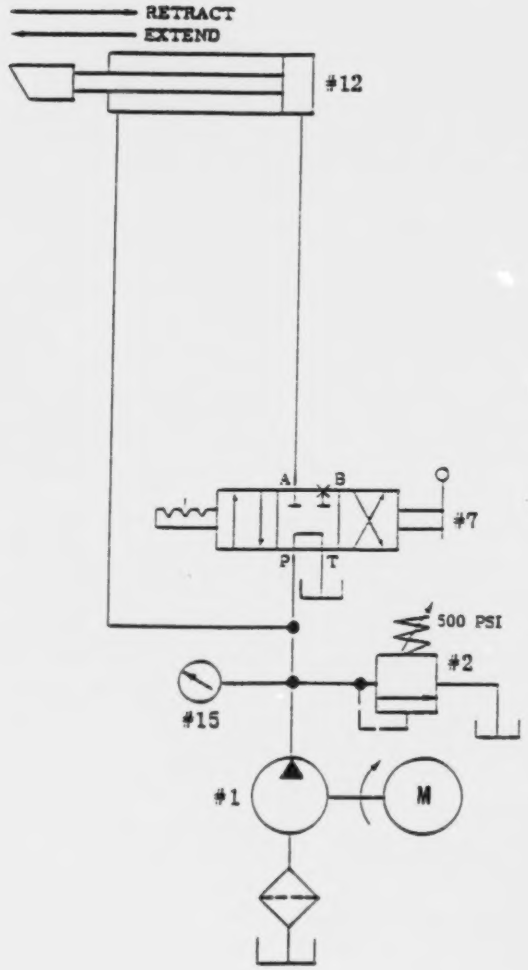
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.

Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.

Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 1	FP-0	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


RETRACT
EXTEND
#12
A
B
P
T
#7
500 PSI
#2
#15
#1
M

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER-HYDRAULIC CIRCUITS LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	REGENERATIVE CIRCUIT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate regenerative circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

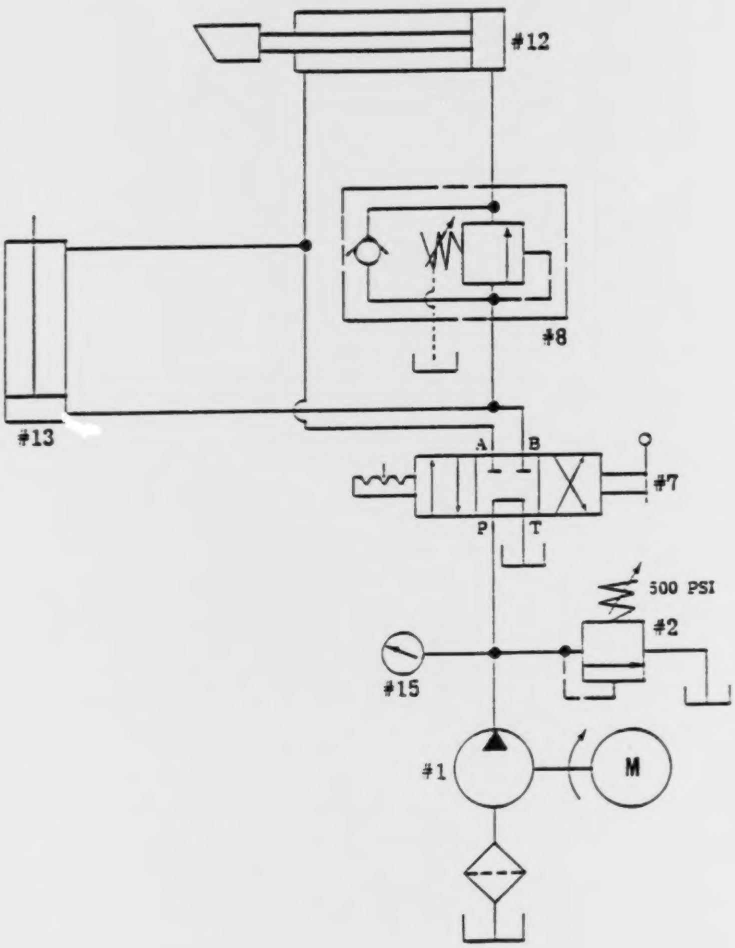
TASK Demonstrate regenerative circuit

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 2	FP-HC 1	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


#12
#8
#13
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	SEQUENCING CIRCUIT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate sequencing circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

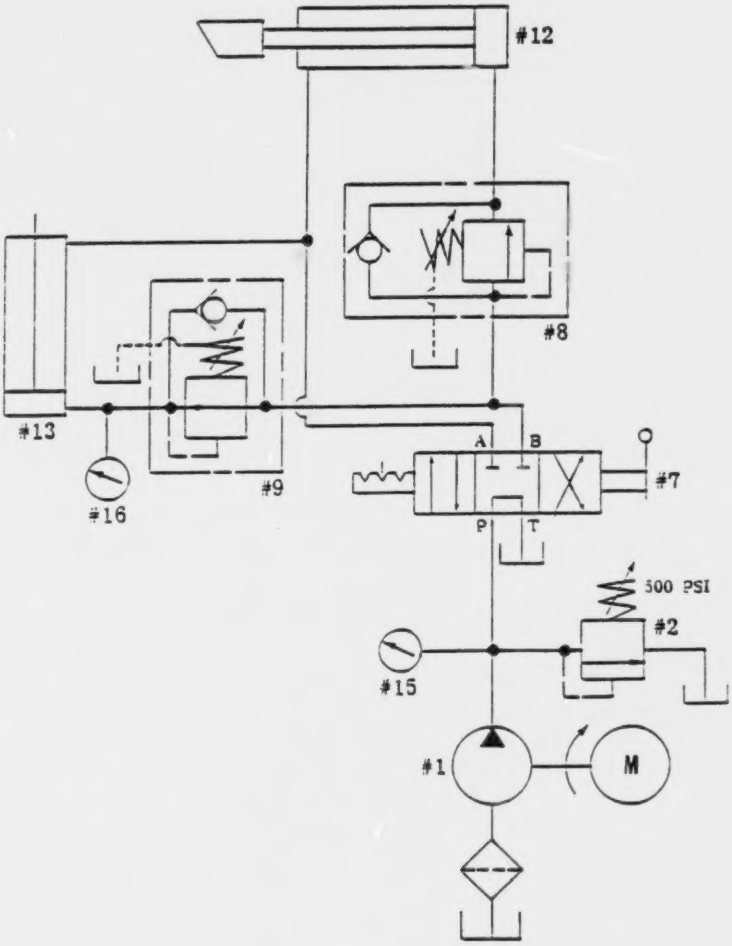
TASK Demonstrate sequencing circuit

REFERENCES

ARO. *Fluid Power Text*. The ARO Corp. Bryan, OH.
Fest. *Hydraulic Workbook*. Festo-didactic. New York, NY.
Parker Training Dept. *Industrial Hydraulic Technology*. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. *fluid Power Designers Lightening Reference Handbook*. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. *Basic Fluid Power*. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. *Industrial Hydraulics Manual*. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. *Understanding Hose & Fittings Service Guide*. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 3	FP-HC 1 - 2	3 Hours

FLUID POWER HYDRAULIC CIRCUITS


#12
#8
#13
#9
#16
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	CIRCUIT WITH LIMITED CLAMPING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate sequencing circuits with limited clamping pressure. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

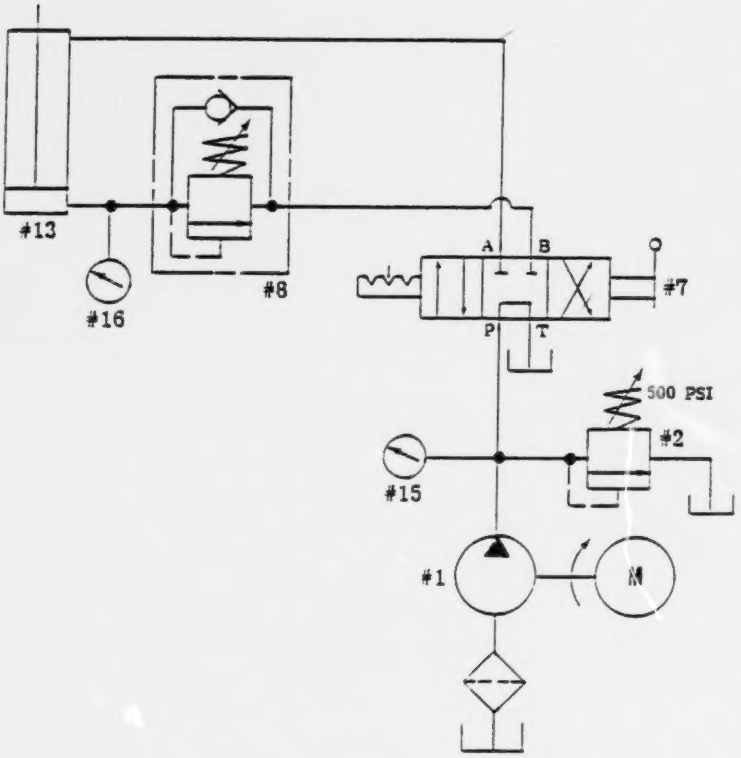
TASK Demonstrate sequencing circuits with limited clamping pressure

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 4	FP-HC 1 - 3	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


#13
#16
#8
A
B
P
T
#7
500 PSI
#2
#15
#1
M

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	COUNTER-BALANCE CIRCUIT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate counter-balance circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

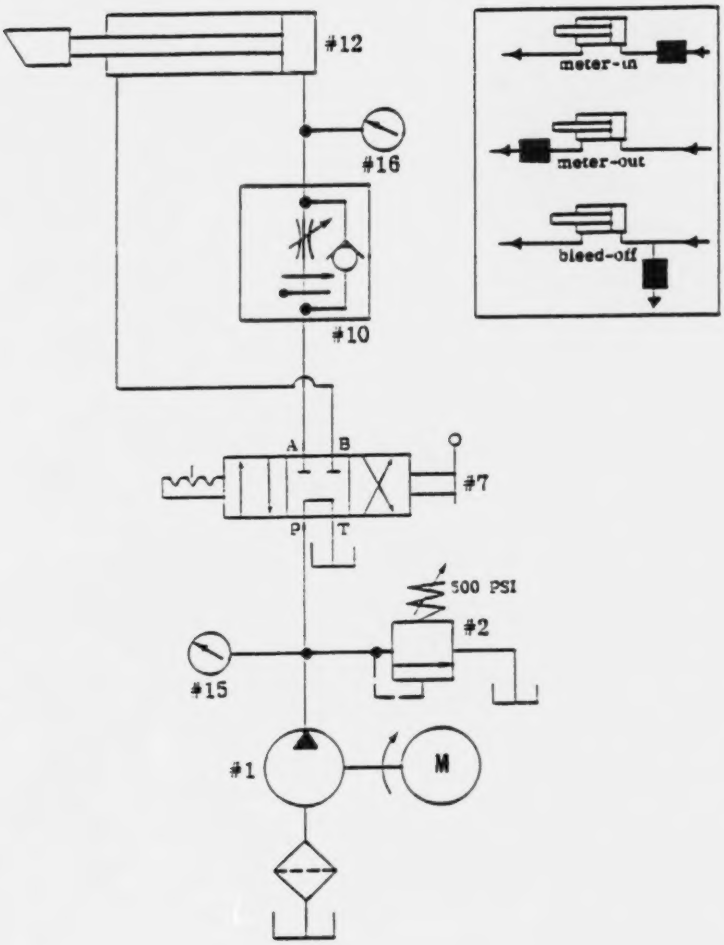
TASK Demonstrate counter-balance circuit

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 5	FP-HC 1 - 4	3 Hours

FLUID POWER HYDRAULIC CIRCUITS


#12
#16
#10
A
B
#7
P
T
500 PSI
#2
#15
#1
M
meter-in
meter-out
bleed-off

LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	SPEED CONTROL

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate hydraulic circuit with speed control. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

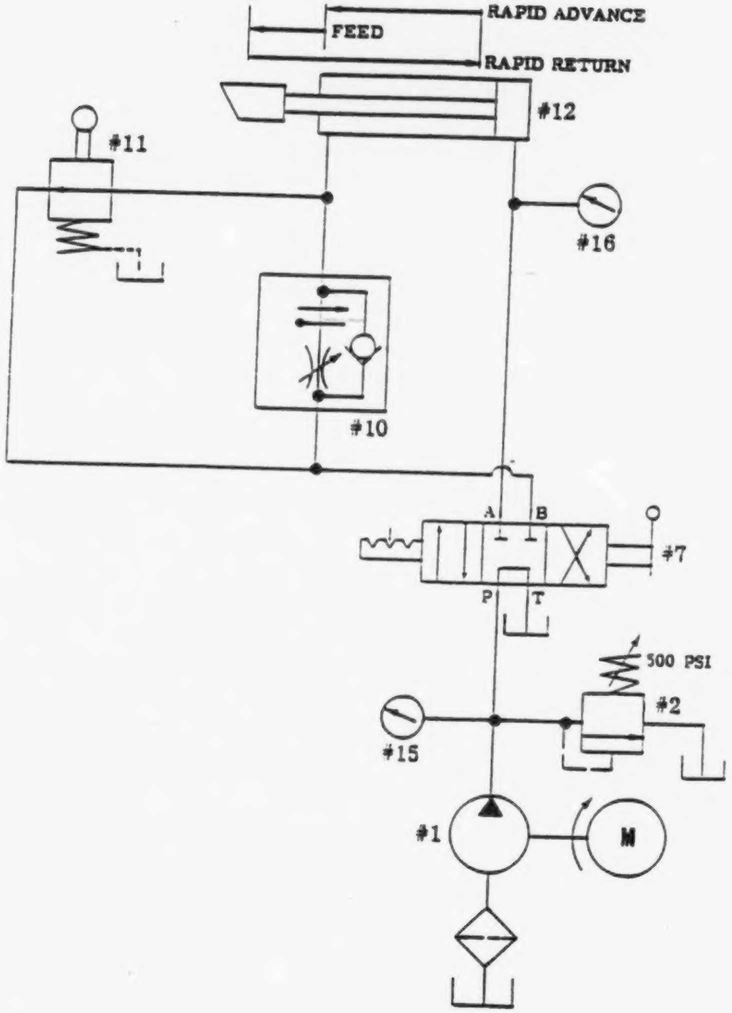
TASK Demonstrate hydraulic circuit with speed control

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 6	FP-HC 1 - 5	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


RAPID ADVANCE
FEED
RAPID RETURN
#12
#11
#16
#10
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 7

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 7

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	TRAVERSE AND FEED

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate traverse and feed circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

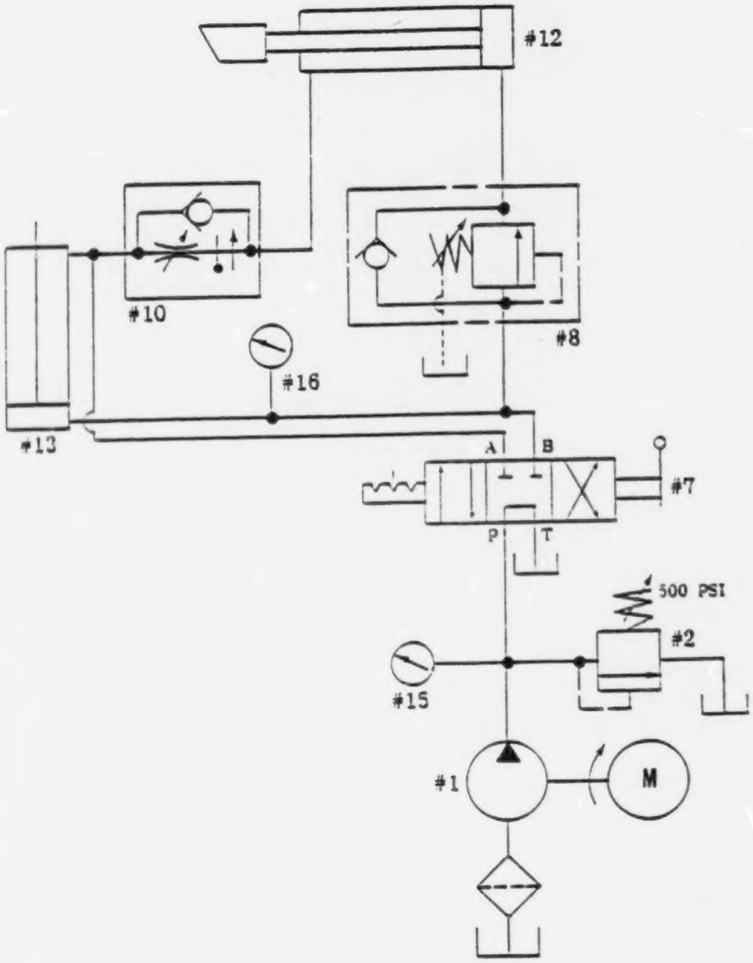
TASK Demonstrate traverse and feed circuit

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers. Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 7	FP-HC 1 - 6	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


#12
#10
#8
#16
#13
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 8

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 8

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	SPEED CONTROL

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate sequencing circuit with speed control. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

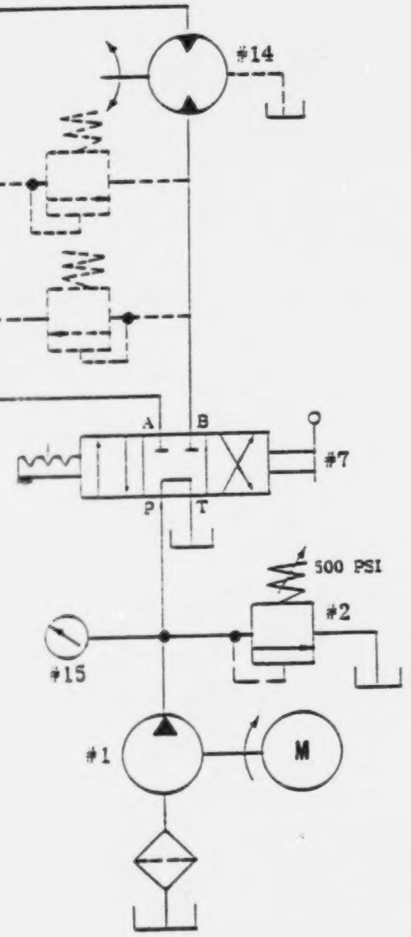
TASK Demonstrate sequencing circuit with speed control

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 8	FP-HC 1 - 7	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


#14
A
B
#7
P
T
500 PSI
#2
#15
#1
M

LAP # 9

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
FLUID POWER—HYDRAULIC CIRCUITS LAP # 9

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	ROTARY MOTION

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate basic hydraulic rotary motion circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

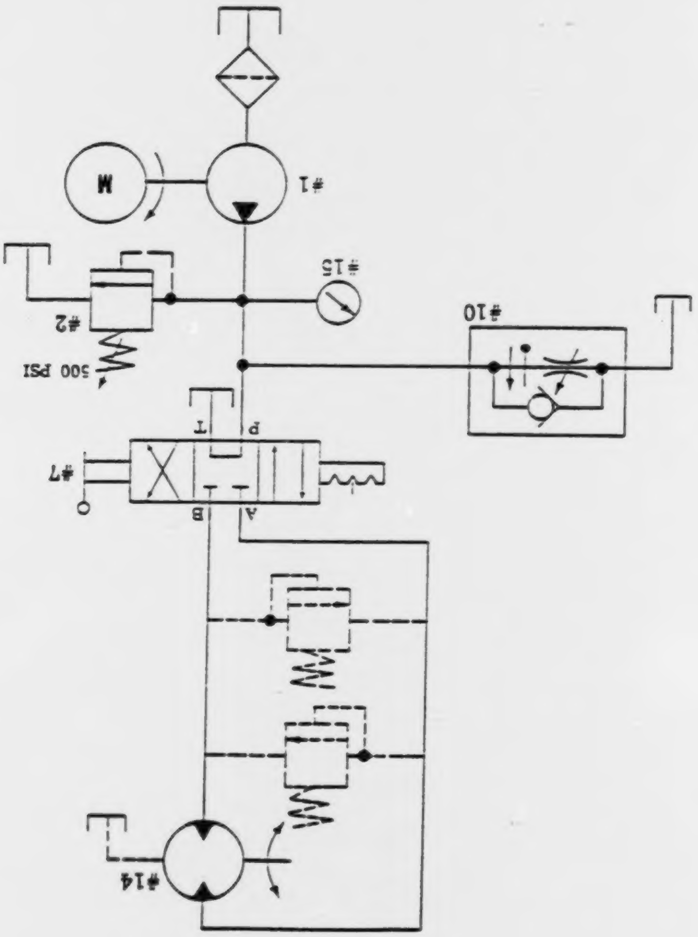
TASK Demonstrate basic hydraulic rotary motion circuit

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 9	FP-HC 1 - 8	3 Hours

FLUID POWER
HYDRAULIC CIRCUITS


M
#1
#15
#2
500 PSI
#10
T
P
#7
B
A
#14

LAP # 10

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LUID POWER—HYDRAULIC CIRCUITS LAP # 10

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	ROTARY DRIVE

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely demonstrate hydraulic rotary drive with speed control. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

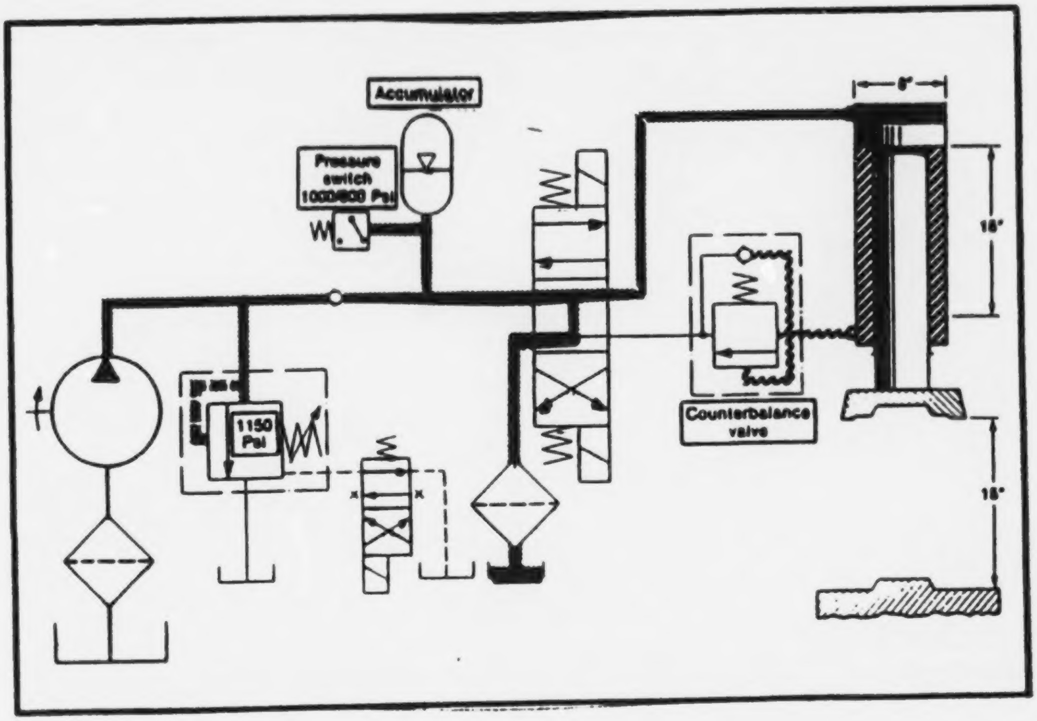
TASK Demonstrate hydraulic rotary drive with speed control

REFERENCES

ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 10	FP-HC 1 - 9	3 Hours

FLUID POWER HYDRAULIC CIRCUITS


Accumulator
Pressure switch 1000/800 Psi
1150 Psi
Counterbalance valve
8"
18"
18"

LAP # 11

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LUID POWER—HYDRAULIC CIRCUITS LAP # 11

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	FLUID POWER
INSTRUCTIONAL UNIT	HYDRAULIC CIRCUITS
LAP TITLE	TROUBLESHOOTING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to safely troubleshoot a hydraulic circuit. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

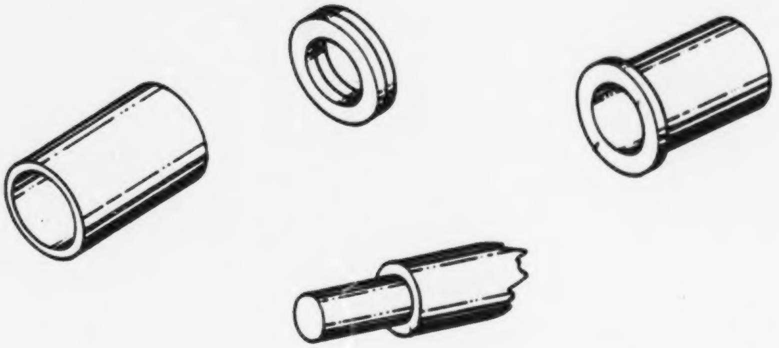
TASK Troubleshoot a hydraulic circuit

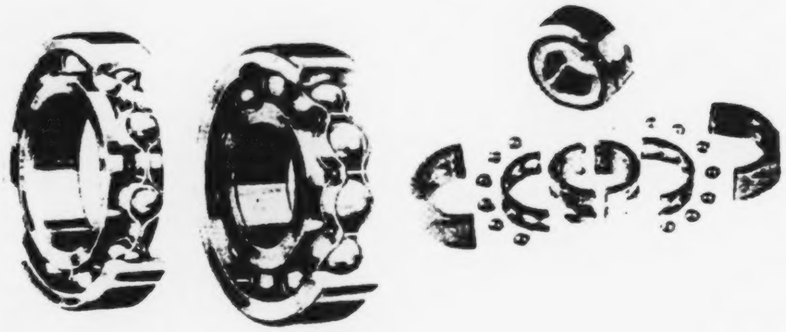
REFERENCES
ARO. Fluid Power Text. The ARO Corp. Bryan, OH.
Fest. Hydraulic Workbook. Festo-didactic. New York, NY.
Parker Training Dept. Industrial Hydraulic Technology. Parker Hannifin Corp. Cleveland, OH. 1989.
Paul-Munroe Hydraulics, Inc. fluid Power Designers Lightening Reference Handbook. 4th Ed. Pico Rivera, CA. 1976.
Pippenger, John j. Basic Fluid Power. Prentice-Hall, Inc. Englewood Cliff, NJ. 1987.
Vickers. Industrial Hydraulics Manual. Vickers, Incorporated-Trinova. Troy, MI. 1984.
Weatherhead. Understanding Hose & Fittings Service Guide. Weatherhead/Dana. Toledo, OH. 1982.

LAP #	Prerequisites	Time Range
FP-HC # 11	FP-HC 1 - 10	3 Hours

MECHANICAL POWER

BEARINGS





LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER BEARINGS LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Bearings
LAP Title	Identifying and Measuring Bearings

Performance Objective After completion of this LAP, you should be able to identify the four basic types of bearings and figure the load for a specified bearing. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Identify type of bearing and figure load

REFERENCES:

1. Davis, Glen C. Packaging/Converting Machinery Components. 4th Edition. Packaging Machinery Manufacturing Institute. Washington D. C. 1988.
2. Tel-A-Train - Video tape - "Maintaining Bearings" and Reference Guide To Maintaining Bearings. Chattanooga, TN. 1987.

LAP #	PREREQUISITES	TIME RANGE
MPT -B LAP # 1	None	2 Hours

[illegible]EARNING ACTIVITY PACKET GU[illegible]E
MECHANICAL POWER TRANSMISSION
BEARINGS - LAP # 1
IDENTIFYING AND MEASURING BEARINGS

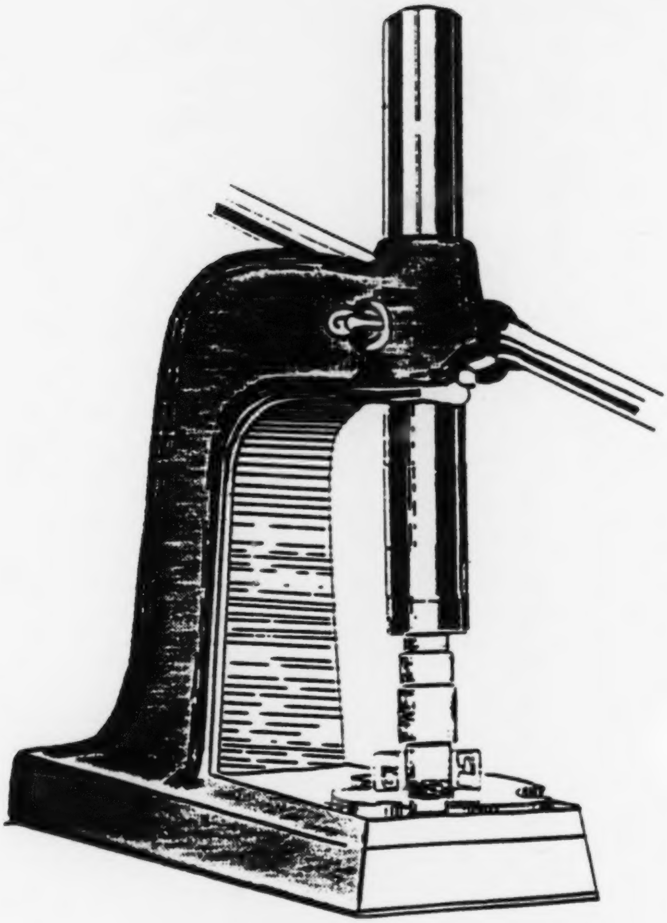
1. GET Video tape "Maintaining Bearings" from cabinet "E", slot # 57 **
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "E", slot # 57 **
5. REVIEW Study sheet, pages 3 - 6
6. DO Assignment sheet # 1, pages 7 & 8
7. CHECK Your work, page 9
8. REVIEW Study sheets, pages 10 - 12
9. DO Assignment sheet # 2, page 13
10. REVIEW Study sheet, page 14
11. READ Job sheet
12. GO To shop and enter using SAFETY procedures
13. GET Materials needed
14. DO Job sheet
15. CHECK Your work
16. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

17. RETURN All tools and materials to their proper places
18. CLEAN Your work area
19. RETURN MPT - B LAP # 1 to cabinet
20. GET MPT - B LAP # 2 from cabinet and continue working

MECHANICAL POWER

BEARINGS



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER BEARINGS LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Bearings
LAP Title	Bearings, Packings, and Seals

Performance Objective After completion of this LAP, you should be able to install and remove plain and anti-friction bearings with the Mechanical Arbor Press. This knowledge will be demonstrated through study sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Install and remove plain and anti-friction bearings with the Mechanical Arbor Press

REFERENCES:

1. Hendrix, Labon J., Millwright Instructional Materials. Oklahoma State board of Vocational and Technical Education. Stillwater, OK. 1980
2. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
3. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
4. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-B LAP # 2	MPT-B LAP 1	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
BEARINGS - LAP # 2
BEARINGS, PACKINGS, AND SEALS

1. REVIEW Study sheets

2. READ Job sheet

3. ENTER Shop using SAFETY procedures

4. GET Materials needed

5. DO Job sheet

6. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7. RETURN Materials to their proper places

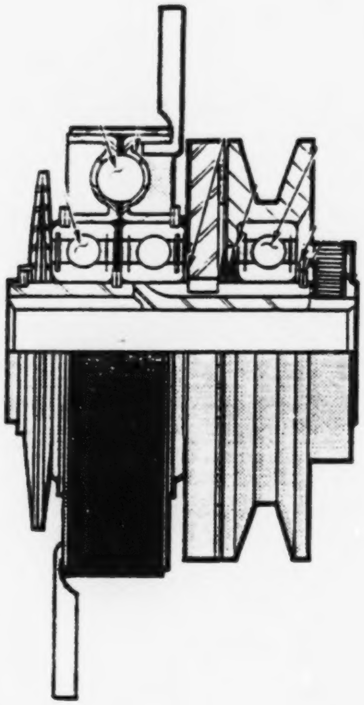
8. CLEAN Your work area

9. RETURN MPT - B LAP # 2 to cabinet

10. GET MPT - B LAP # 3 from cabinet and continue

MECHANICAL POWER

CLUTCHES AND BRAKES



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER C/B LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area Mechanical Power Transmission

Instructional Unit Clutches/Brakes

LAP Title Positive Engagement Clutches

Performance Objective After completion of this LAP, you should be able to identify, disassemble, and assemble one-way positive engagement clutches. This knowledge will be demonstrated through study sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Demonstrate identification, assembly, and disassembly of one-way positive engagement clutches

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-C/B LAP # 1	None	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
CLUTCHES/BRAKES LAP # 1

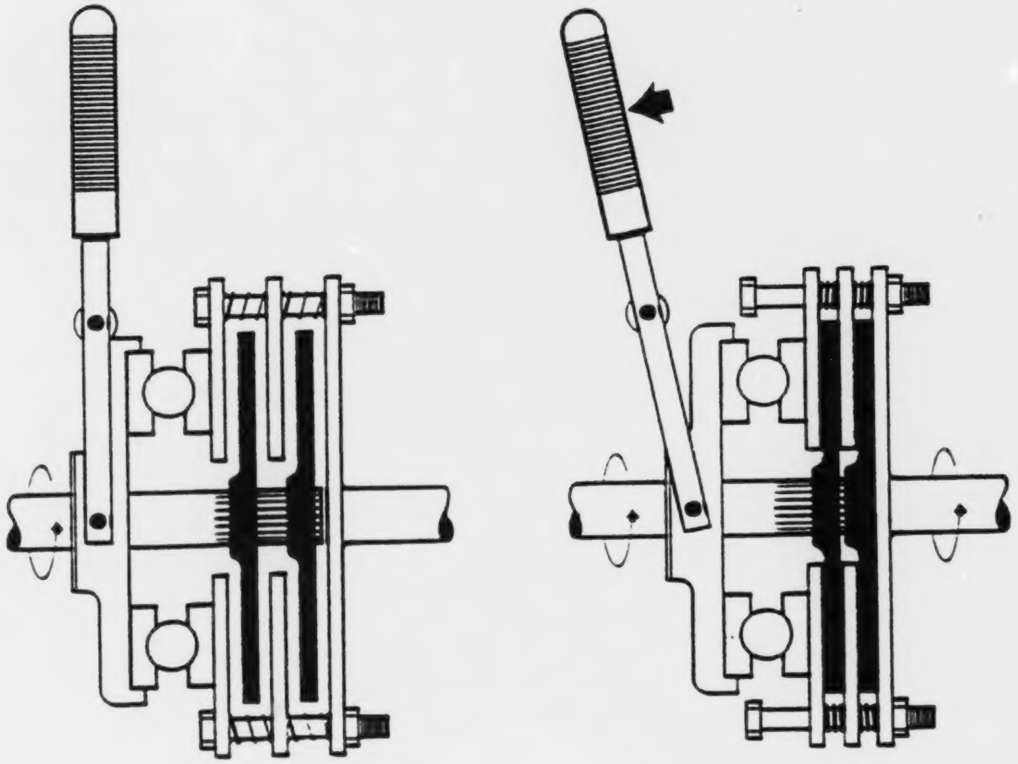
1. GET Video tape from cabinet "E", slot 64 **
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. REVIEW Study sheets
6. READ Job sheet
7. GO To shop using SAFETY procedures
8. GET Materials need
9. DO Job sheet, FOLLOWING STEPS CAREFULLY
10. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

11. RETURN Materials to their proper places
12. CLEAN Your work area
13. RETURN MPT - C/B LAP # 1 to cabinet
14. GET MPT - C/B LAP # 2 from cabinet and continue

MECHANICAL POWER

CLUTCHES AND BRAKES



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER C/B LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Clutches/Brakes
LAP Title	Friction Clutches and Brakes

Performance Objective After completion of this LAP, you should be able to disassemble, sketch, measure, and reassemble clutch and brake assembly. This knowledge will be demonstrated through study sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Disassemble, sketch, measure, and reassemble clutch and brake assembly

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.
4. Reference Guide to Maintaining Brakes & Clutches. Tel-A-Train,Inc. Chattanooga, TN. 1987.

LAP #	PREREQUISITES	TIME RANGE
MPT-C/B LAP # 2	MPT-C/B LAP # 1	2 Hours

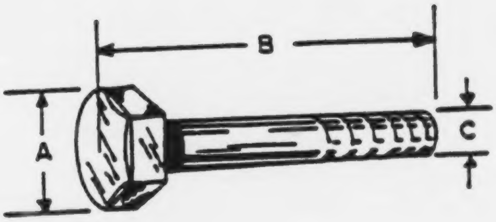
LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
CLUTCHES/BRAKES LAP # 2

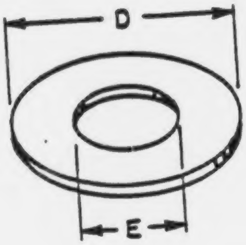
1. REVIEW Study sheets
2. READ Job sheet
3. ENTER Shop using SAFETY procedures
4. GET Materials need
5. DO Job sheet, FOLLOWING STEPS CAREFULLY
6. SIGNAL Your INSPECTOR to check your work

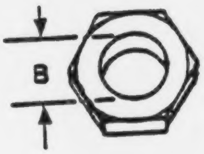
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

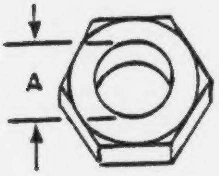
7. RETURN Materials to their proper places
8. CLEAN Your work area
9. RETURN MPT - C/B LAP # 2 to cabinet
10. GET MPT - C/B LAP # 3 from cabinet and continue

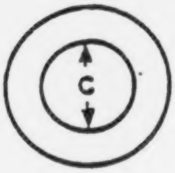
FASTENERS

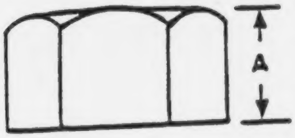


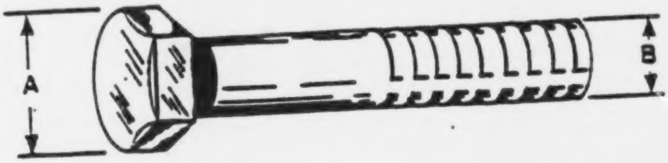












INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Fasteners
LAP Title	Measuring Machine Bolts & Screws

Performance Objective After completion of this LAP, you should be able to identify machine bolts and screws, read a fastener blueprint, measure bolts and screws with: a machinist ruler, dial caliper, and a screw pitch gauge. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK: Demonstrate the ability to identify and measure machine bolts and screws

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #		PREREQUISITES	TIME RANGE
MPT-F LAP #	1	None	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION - FASTENERS
LAP # 1
MEASURING MACHINE BOLTS AND SCREWS

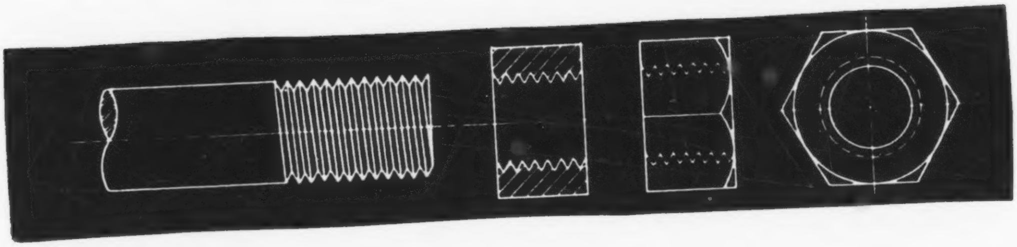
1. REVIEW Study sheets, pages 2 & 3
2. COMPLETE Assignment sheet # 1
3. CHECK Your answers--if you missed one, review the study sheet again and correct your answer
4. REVIEW Study sheets, pages 5 - 7
5. COMPLETE Study sheet # 2
6. READ Job sheet--you should understand what you are to do before entering the shop
7. ENTER Shop using SAFETY procedures
8. GET Equipment and materials required
9. GO To the "Fastener" workbench in the MPT area of the shop
10. DO Job sheet
11. SIGNAL Your INSPECTOR to check your completed work

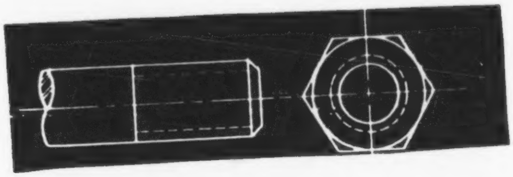
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

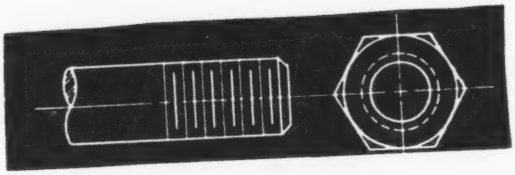
12. RETURN All tools to their proper place
13. CLEAN Your work area
14. RETURN The MPT-F LAP # 1 to the cabinet
15. GET MPT-F LAP # 2 from the cabinet and continue working

MECHANICAL POWER

FASTENERS







LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Fasteners
LAP Title	Internal and External Tapping

Performance Objective After completion of this LAP, you should be able to perform a layout from a blueprint and perform the specified work of tapping internal and external threads. This knowledge will be demonstrated through study sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS:

- Perform a layout from a blueprint
- Perform drilling operation to layout specification
- Tap external and internal threads
- Repair damaged threads
- Remove a broken bolt/screw

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-F LAP # 2	MPT-F LAP # 1	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
FASTENERS - LAP # 2
INTERNAL AND EXTERNAL TAPPING

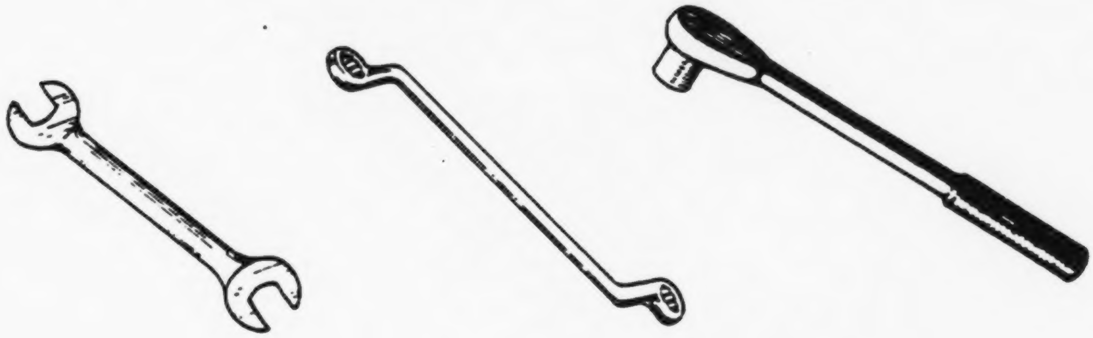
1. REVIEW — Study sheets
2. COMPLETE — Assignment sheet # 1
3. CHECK — Your answers--if you missed one, go back and review the study sheet again before correcting your answer
4. READ — Job sheet very carefully--if there is something you do not understand, go back and find the answer in the study sheets.
5. ENTER — Shop using SAFETY procedures
6. GET — Materials and tools needed
7. GO — To the "Fastener" workbench in the Mechanical Power Transmission area of the shop
8. DO — Job sheet
9. SIGNAL — Your INSPECTOR to check your completed work

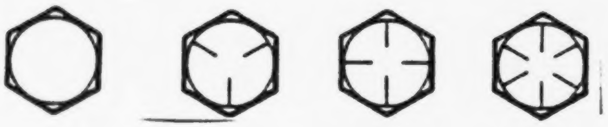
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

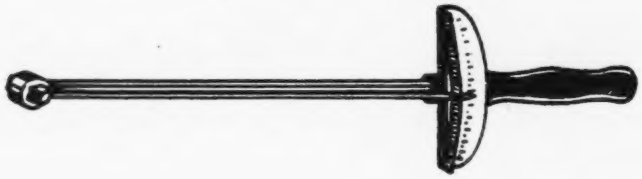
10. RETURN — All tools to their proper place
11. CLEAN — Your work area
12. GET — Initial stamps and a ball peen hammer
13. STAMP — Your initials on the back of your workpiece
14. RETURN — Your initial stamps and ball peen hammer
15. RETURN — MPT-F LAP # 2 to the cabinet
16. GET — MPT-F LAP # 3 from the cabinet and continue working

MECHANICAL POWER

FASTENERS







LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Fasteners
LAP Title	Assembling with Fasteners

Performance Objective After completion of this LAP, you should be able to; identify types of screw heads, washers, wrenches, match bolt/screw head to correct size of wrench and understand how to figure and apply torque. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS: Assemble and disassemble component parts requiring torque

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-F LAP # 3	MPT-F LAPs 1 & 2	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
FASTENERS - LAP # 3
ASSEMBLING WITH FASTENERS

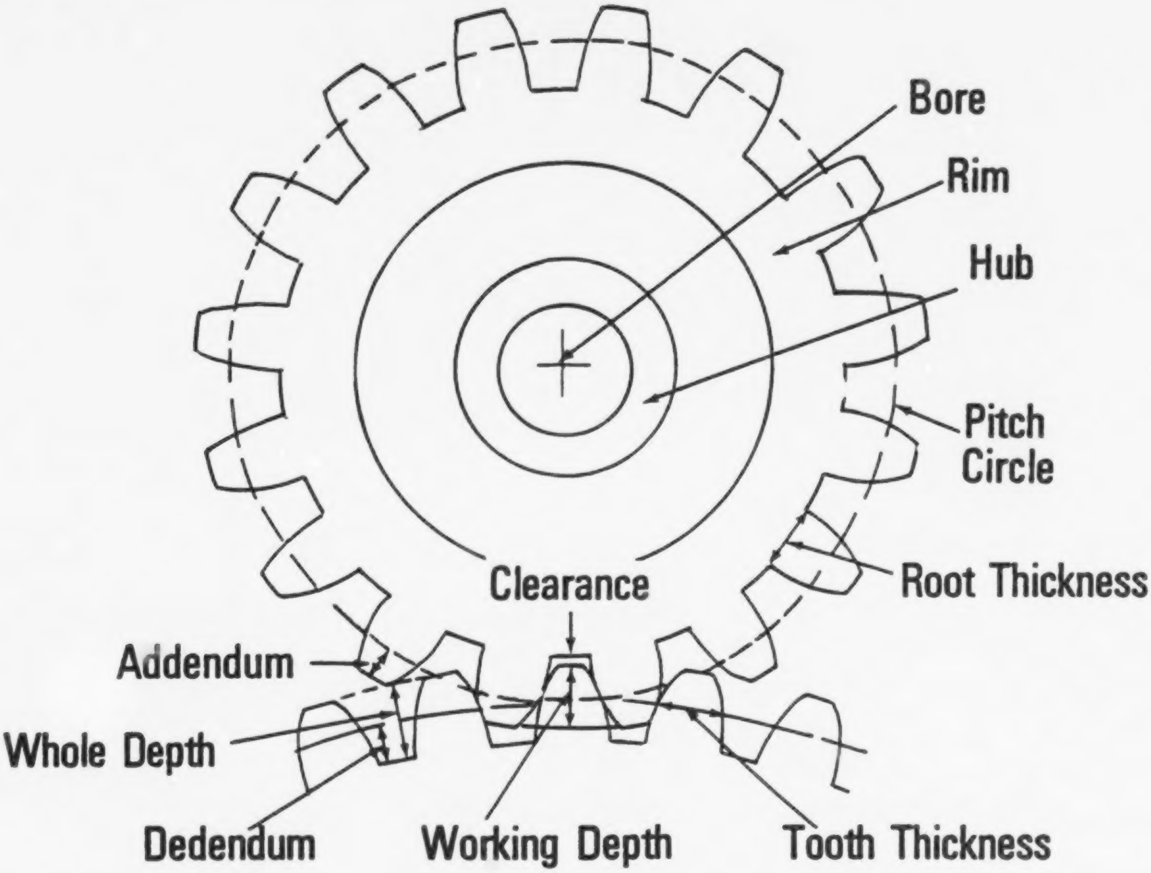
1.	REVIEW	Study sheets, pages 3 - 5
2.	COMPLETE	Assignment sheet # 1
3.	CHECK	Your answers--if you missed one, review the study sheet again and correct your answers
4.	REVIEW	Study sheets, pages 9 - 14
5.	COMPLETE	Assignment sheet # 2
6.	CHECK	Your answers--if you missed one, review the study sheet again and correct your answers
7.	READ	Job sheet--you should understand what you are to do before entering the shop
8.	ENTER	Shop using SAFETY procedures
9.	GET	Materials and tools needed
10.	GO	To the "Fastener" workbench in the MPT area of the shop
11.	DO	Job sheet
12.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

13.	RETURN	All tools to their proper place
14.	CLEAN	Your work area
15.	GET	Initial stamps and a ball peen hammer
16.	STAMP	Your initials on the back of your workpiece
17.	RETURN	Initial stamps and ball peen hammer
18.	RETURN	MPT-F LAP # 3 to the cabinet
19.	GET	MPT-F LAP # 4 from the cabinet and continue working

MECHANICAL POWER

GEARS



Bore
Rim
Hub
Pitch Circle
Root Thickness
Clearance
Addendum
Whole Depth
Dedendum
Working Depth
Tooth Thickness

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER GEARS LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Gears
LAP Title	Identify and Measurement

Performance Objective After completion of this LAP, you should be able to identify, measure and size major types of gears utulizing manufactures specifications. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Identify, measure, and size major types of gears utilizing manufactures specifications.

REFERENCES:

1. Davis, Glenn D. Packaging/Converting Machinery Components. 4th Edition. Packaging Machinery Manufacturing Institute. Washington D. C. 1988.
2. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
3. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
4. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.
5. Tel-A-Train - Video tape - "Gearing". Chattanooga, TN. 1987.

LAP #	PREREQUISITES	TIME RANGE
MPT G LAP # 1	None	3 Hours

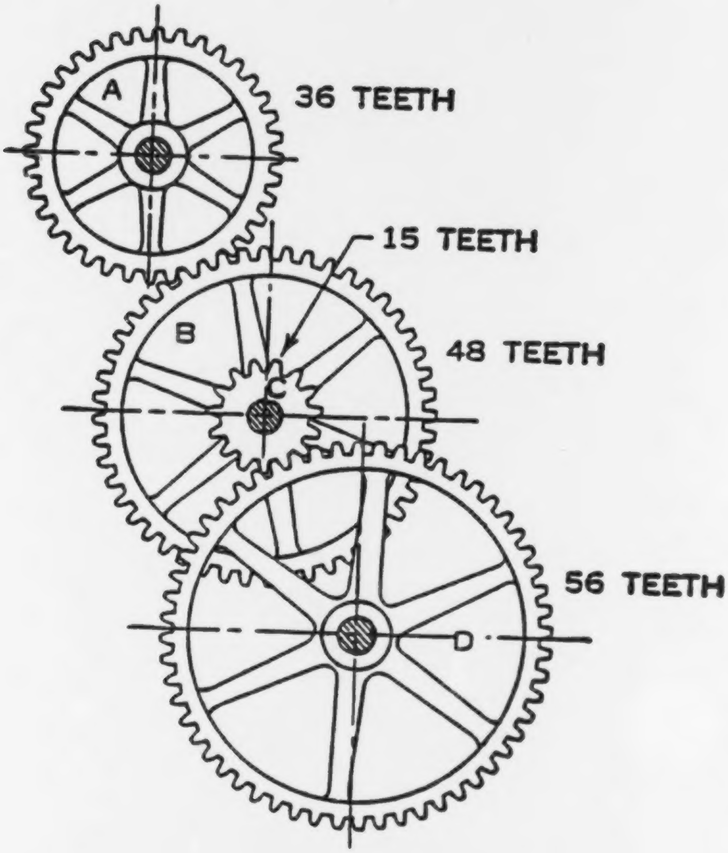
LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
GEARS - LAP # 1

1.	GET	Video tape "Gearing" from cabinet "E", slot # 58 *
2.	VIEW	Video Tape
3.	REWIND	Video Tape
4.	RETURN	Video Tape to cabinet "E" slot # 58 **
5.	ENTER	Shop practicing SAFETY procedures, you will need pencil and paper,
6.	GO	To GEARS workbench in the Mechanical Power Transmission area
7.	REVIEW	Study Sheets pages 3 - 5
8.	DO & CHECK	Assignment sheet # 1 pages 6 - 7
9.	REVIEW	Study Sheets pages 8 - 9
11.	Do & CHECK	Assignment sheet # 2, page 10 - 12
12.	REVIEW	Study Sheet pages 13 - 14
13.	DO & CHECK	Assignment sheet, page 15
14.	READ	JOB sheet
15.	DO	JOB SHEET
16.	Signal	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

17.	RETURN	All tools and materials to their proper places
18.	CLEAN	Your work area
19.	RETURN	MPT-B # 1 to cabinet
20.	GET	MPT - B # 2 from cabinet and continue working

GEARS


A
36 TEETH
15 TEETH
B
48 TEETH
C
56 TEETH
D

COMPOUND GEAR TRAIN

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER GEARS LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	Gears
LAP Title	Compound Gear Train

Performance Objective After completion of this LAP, you should be able to disassemble, calculate ratios, and reassemble a compound gear train. This knowledge will be demonstrated through study sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Demonstrate disassembly, ratio calculations, and reassembly of a compound gear train

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-G LAP # 2	MPT-G LAP #1	2 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
GEARS - LAP # 2

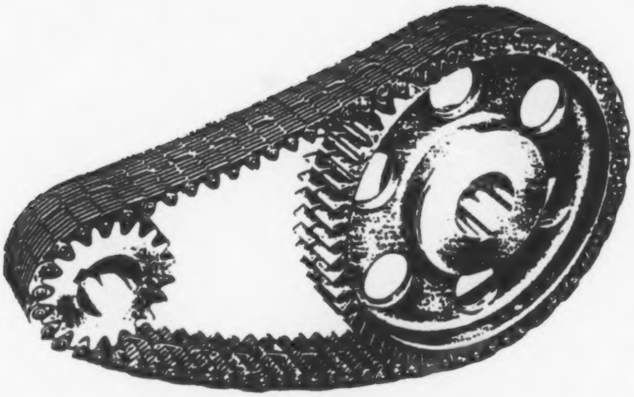
1. REVIEW Study sheets
2. READ Job sheet
3. ENTER Shop using SAFETY procedures
4. GET Materials needed
5. DO Job sheet
6. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7. RETURN Materials to their proper places
8. CLEAN Your work area
9. RETURN MPT - G LAP # 2 to the cabinet
10. GET MPT -G LAP # 3 from the cabinet and continue

MECHANICAL POWER

V-BELTS AND CHAINS



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER V-B & C LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	V-Belts and Chains
LAP Title	Identification & Measurement

Performance Objective After completion of this LAP, you should be able to identify type, determine chain/sprocket number, and calculate speed ratio. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Identify type, determine chain/sprocket number, and calculate speed ratio

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT VB/C LAP # 1		2 Hours

172

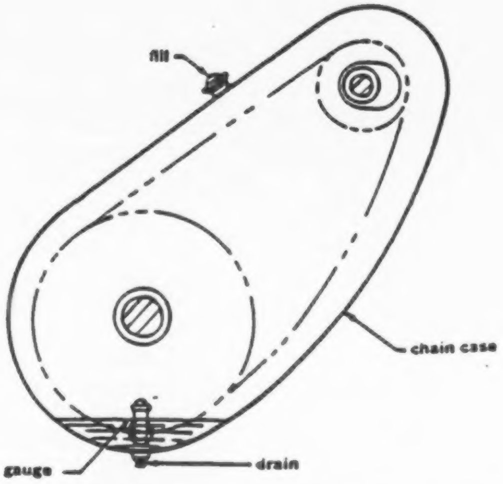
LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
V-BELTS & CHAINS LAP # 1

1. GET Video tape "Roller Chain" from cabinet "E", slot # 62 **
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "E", slot # 62 **
5. REVIEW Study sheet
6. DO Assignment sheet
7. CHECK Your answers to make sure they are correct
8. REVIEW Study sheet
9. DO Assignment sheet
10. CHECK Your answers to make sure they are correct
11. REVIEW Study sheet
12. READ Job sheet
13. ENTER Shop using SAFETY procedures
14. GET Materials needed
15. GO To V-Belt/Chain workbench
16. DO Job sheet
17. SIGNAL Your INSPECTOR to check your work

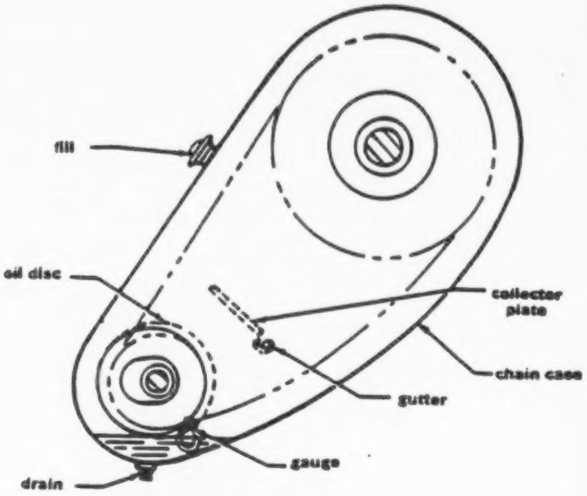
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON THIS LAP

18. RETURN Materials to their proper places
19. CLEAN Your work area
20. RETURN MPT-V.B & C LAP # 1 to cabinet
21. GET MPT-V.B & C LAP # 2 from cabinet and continue

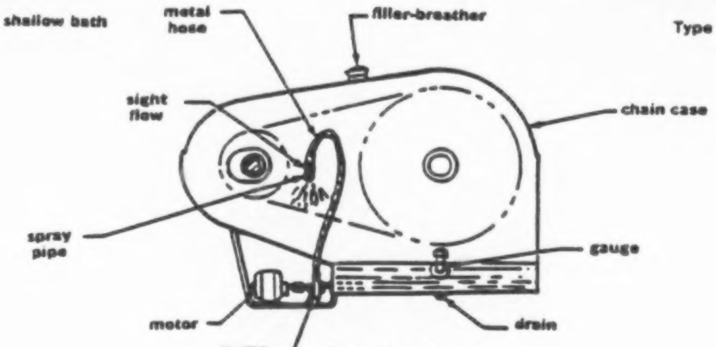
V-BELTS AND CHAINS


fill
chain case
gauge
drain

Type III, shallow bath


fill
oil disc
collector plate
chain case
gutter
gauge
drain

Type III, disc or slinger


metal hose
filler-breather
sight flow
chain case
spray pipe
gauge
motor
drain
pump

Type IV, oil stream

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
MECHANICAL POWER V-B & C LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Mechanical Power Transmission
Instructional Unit	V-Belts and Chains
LAP Title	Inspection & Installation

Performance Objective After completion of this LAP, you should be able to disassemble, inspect, and reassemble chain/sprocket assembly. This knowledge will be demonstrated through study sheets, assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK:

Disassemble, inspect, and reassemble chain/sprocket assembly

REFERENCES:

1. Kibbe, Richard R., Melly John E., Meyer, Roland O., and White, Warren T. Machine Tool Practices. John Wiley & Sons. New York, NY. 1982.
2. Krar, S. F., Oswald, J. W., and St. Amand, J. E. Machine Shop Operations, Visutext. McGraw-Hill Ryerson Limited. New York, NY. 1975.
3. Ludwig, Oswald A., McCarthy, Willard J., and Repp, Victor E. Metalwork Technology and Practice. McKnight Publishing Company. Bloomington, IL. 1968.

LAP #	PREREQUISITES	TIME RANGE
MPT-VB & C LAP # 2	MPT-VB & C LAP # 1	3 Hours

LEARNING ACTIVITY PACKET GUIDE
MECHANICAL POWER TRANSMISSION
V BELTS AND CHAINS LAP # 2

1. REVIEW Study sheet
2. DO Assignment sheet
3. CHECK Your answers to make sure they are correct
4. REVIEW Study sheet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All materials to their proper places
11. CLEAN Your work area
12. RETURN MPT-V.B/C LAP # 2 to the cabinet
13. GET MPT-V.B/C LAP # 3 from the cabinet and continue

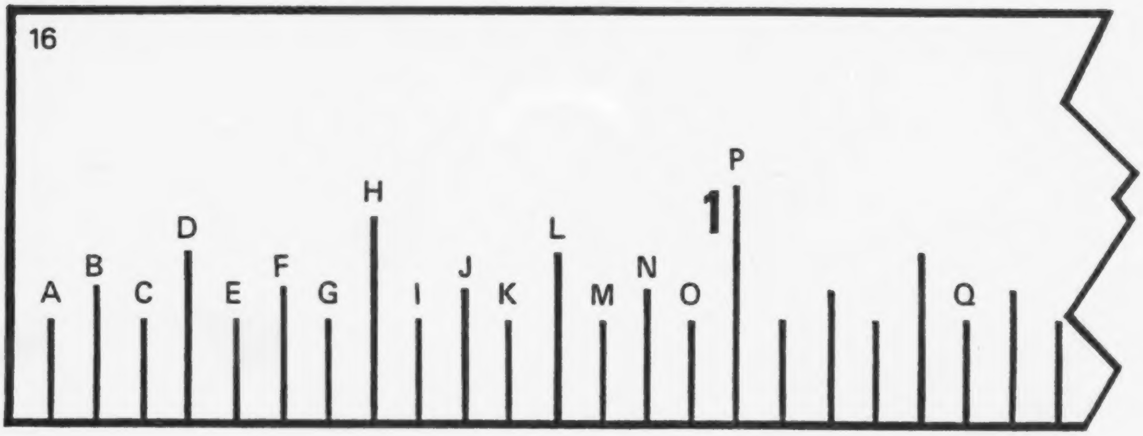
MACHINING LEARNING ACTIVITY PACKETS

MACHINING

BENCH METALS

LATHE

BENCH METALS


16
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
1
P
Q

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Steel ruler

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to use a steel ruler to measure linear and circular objects. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to use a steel ruler in graduations up to 1/32", (utilizing a linear and circular measurement kit) within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.
3 - "Reading a Ruler". Video Tape, Bergwall Productions. Garden City, NY.

LAP #	Prerequisites	Time Range
B M # 1	Bench Metals LAP # 0	3 Hours

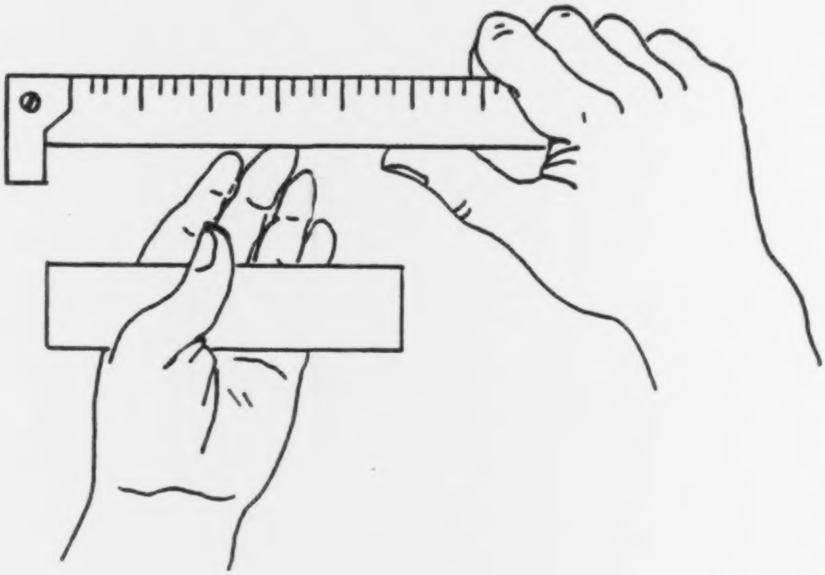
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 1

1. GET Video tape "Reading a Ruler, Customary system" located in cabinet "E", slot # 1 *
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "E", slot # 1 *
5. REVIEW Study sheet showing eighths and sixteenths graduated ruler, following directions on the sheets as you compare the two
6. COMPLETE Assignment sheet
7. CHECK Your answers using the key on the assignment sheet
8. READ Job sheet, identify equipment needed and procedures
9. GET Video tape "Steel Rulers" located in cabinet "A", slot # 38*
10. VIEW Video tape
11. REWIND Video tape and reset counter
12. RETURN Video tape to cabinet "A", slot # 38 **
13. ENTER Shop using SAFETY procedures
14. GET Materials needed
15. TAKE Your equipment to one of the blue workbenches with a vise
16. DO Job sheet
17. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

18. RETURN Materials to their proper places
19. CHECK To be sure your work area is clean
20. GET Bench Metal LAP # 2

BENCH METALS



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Hook Ruler

Performance Objective After completion of this LAP, you should be able to demonstrate your ability to use a hook ruler to measure both linear and circular items. This knowledge will be demonstrated through a study sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate ability to use a hook ruler to measure linear and circular items within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

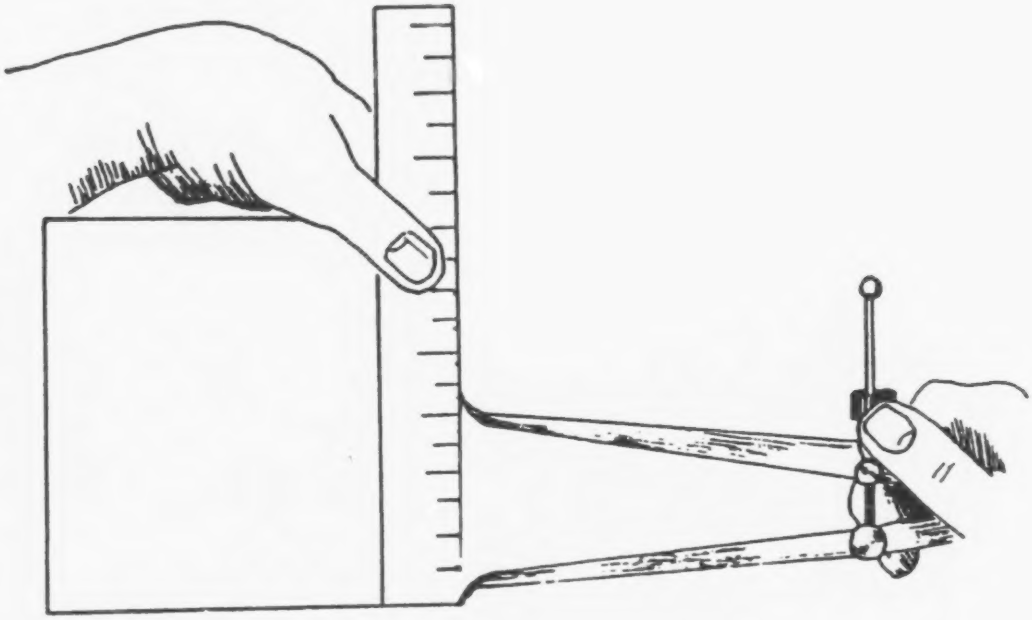
LAP #	Prerequisites	Time Range
B M # 2	Bench Metals LAPs 0 - 1	1 Hour

LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 2
HOOK RULER

1.	REVIEW	Study sheet
2.	READ	Job sheet
3.	ENTER	Shop using SAFETY procedures
4.	GET	Materials needed
5.	GO	To blue workbench with vise
6.	DO	Job sheet
7.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

8.	RETURN	All materials to their proper places
9.	CLEAN	Up your work area
10.	GET	BENCH METALS LAP # 3



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Calipers

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to use a steel ruler to set calipers and take inside and outside measurements with a caliper. This knowledge will be demonstrated through a study sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to use a steel ruler to set calipers and take inside and outside measurements of designated materials within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1982. Stillwater, OK.

2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 3	Bench Metals LAPs 0 - 2	1 Hour

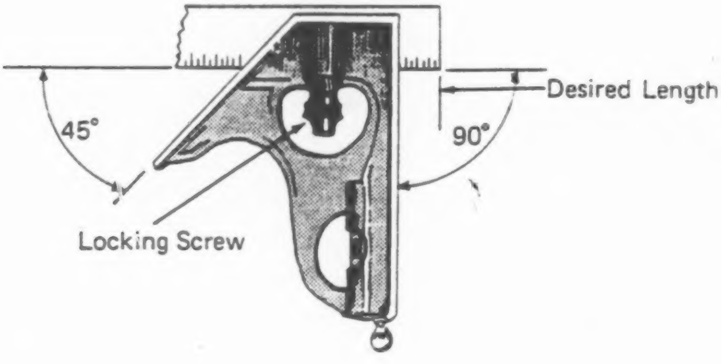
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 3
CALIPERS

1. GET Video tape "Setting Calipers with a Steel Ruler" from cabinet "A", slot # 38 *
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "A", slot # 38 *
5. REVIEW Study sheet
6. READ Job sheet
7. ENTER Shop using SAFETY procedures
8. GET Materials needed
9. GO To Blue workbench
10. DO Job sheet
11. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. REMOVE Layout marks with sand paper
13. RETURN Materials to their proper places
14. CLEAN Up your work area
15. GET BENCH METALS LAP # 4

FIGURE 1


45°
90°
Desired Length
Locking Screw

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 4

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Combination Square

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to use a combination square to take measurements and to perform a layout to specifications. This knowledge will be demonstrated through a study sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate use of a combination square to take measurement and perform a layout to specifications within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

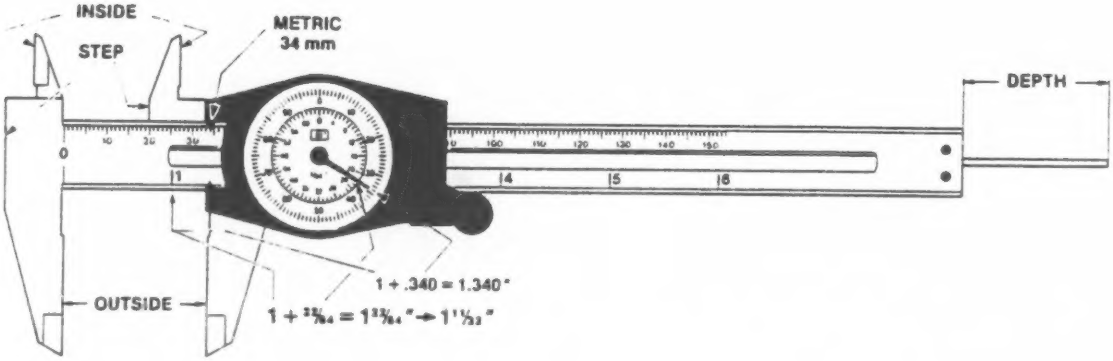
LAP #	Prerequisites	Time Range
B M # 4	Bench Metals LAPs 0 - 3	3 Hours

LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 4
COMBINATION SQUARE

1.	GET	Video tape "Combination Square" from cabinet "A", slot # 38 **
2.	VIEW	Video tape
3.	REWIND	Video tape and reset counter
4.	RETURN	Video tape to cabinet "A", slot # 38 **
5.	REVIEW	Study sheet
6.	READ	Job sheet
7.	ENTER	Shop using SAFETY procedures
8.	GET	Materials needed from storage shelf Tray #7 (front section)
9.	GO	To a blue workbench with vise
10.	DO	Job sheet
11.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12.	REMOVE	Layout marks with sand paper
13.	RETURN	All materials to their proper places
14.	CLEAN	Up your work area
15.	GET	LAP B M # 5


INSIDE
STEP
METRIC
34 mm
DEPTH
OUTSIDE
1 + .340 = 1.340"
1 + 22/64 = 1 22/64" → 1 11/32"

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 5

LEARNING ACTIVITY PACKET

Major Instructional Area Machine Shop

Instructional Unit Bench Metals

LAP Title Dial Caliper

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to set and use a dial caliper for outside, depth, and inside measurements. This knowledge will be demonstrated through a study sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to set and use a dial caliper for outside, depth, and inside measurements within a tolerance of + - .010"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 5	Bench Metals LAPs 0 - 4	3 Hours

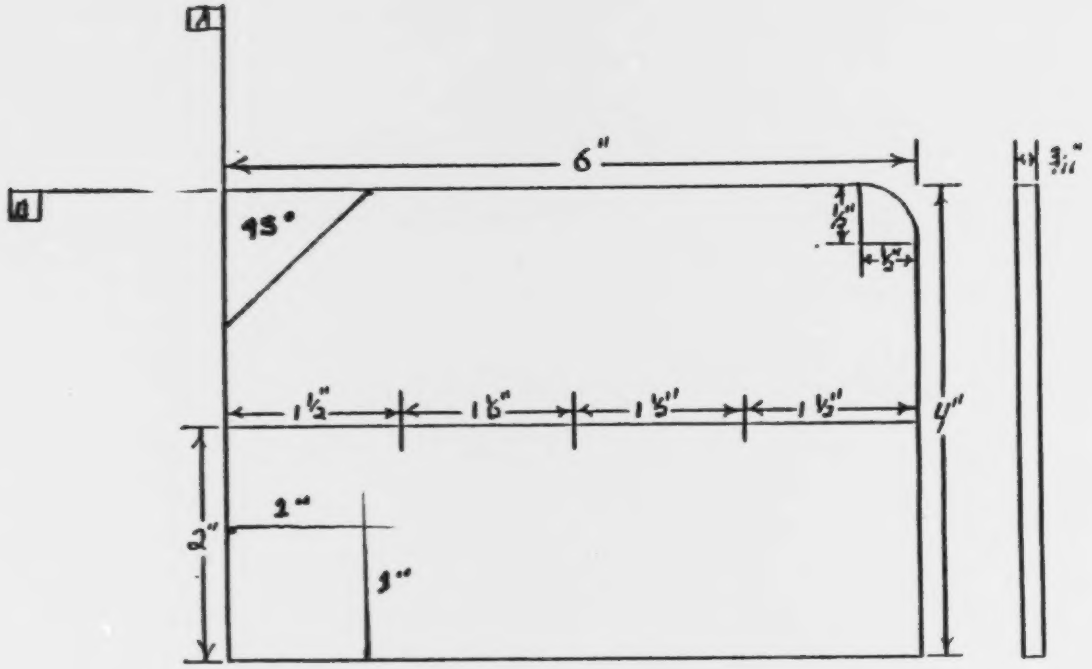
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 5
DIAL CALIPER

1.	REVIEW	Study sheet
2.	READ	Job sheet
3.	ENTER	Shop using SAFETY procedures
4.	GET	Materials needed from Trays 1 - 6 located on the storage shelf
5.	DO	Job sheet
6.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7.	RETURN	Materials to their proper places
8.	CLEAN	Up your work area
10.	GET	LAP B M # 6

BENCH METALS


b
a
6"
45°
1/2"
1/2"
3/16"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
4"
2"
1"
1"

LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 6

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Reference Point Layout to Specifications

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to create a layout to specifications using safety procedures. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to create a precision layout according to given specifications within a tolerance of + - 1/32"

Reference
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.
3 - RMI Video Productions, "Basic Layout Procedures", "Hole Location" and "3 Contours & Angles", Kansas City, MO

LAP #	Prerequisites	Time Range
B M # 6	Bench Metals LAPs 0 - 5	3 Hours

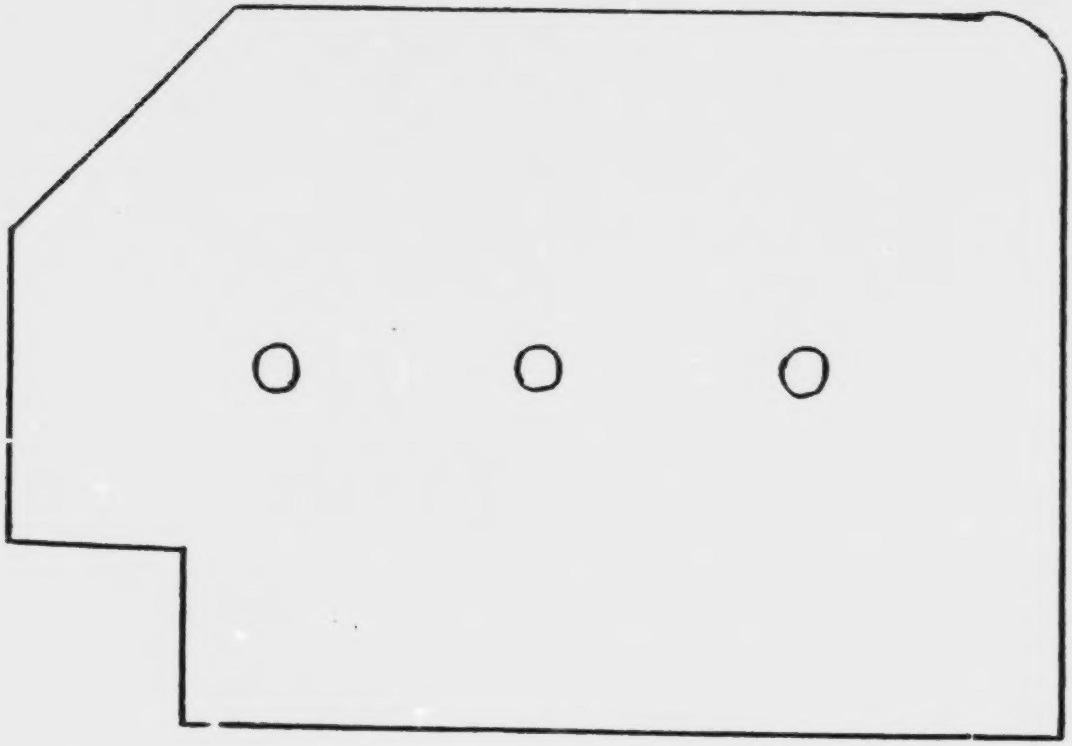
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 6
REFERENCE POINT LAYOUT TO SPECIFICATIONS

1.	GET	Video tape "Basic Layout Procedures from cabinet "A", slot # 1 *
2.	VIEW	Video tape
3.	REWIND	Video tape and reset counter
4.	RETURN	Video tape to cabinet
5.	READ	Job sheet
6.	GET	Video tape "Perform Layout with Combination Square Set" from cabinet "A", slot # 47 **
7.	VIEW	Video tape footage ____ through ____
8.	REWIND	Video tape and reset counter
9.	RETURN	Video tape to cabinet
10.	ENTER	Shop using SAFETY procedures
11.	GET	Stock from blue shelving, Tray 7
12.	GO	To a blue workbench with vise
13.	DO	Job sheet **NOTE Viewing additional video tapes as indicated on your job sheet
14.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

15.	RETURN	All materials to their proper places
16.	CLEAN	Up your work area
17.	GET	Your initial stamps and a ball peen hammer from tool room
18.	STAMP	Your initials in the center of the backside
19.	RETURN	Your initial stamps and ball peen hammer to their proper place
20.	KEEP	Your reference point layout in your locker to use with LAP B M # 7
21.	GET	LAP B M # 7

BENCH METALS



LAP # 7

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 7

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Fabricate Metal Layout

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to safely perform a fabrication utilizing hand tools to specification. This knowledge will be demonstrated through a study sheet, a safety test (100% accuracy required), a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to fabricate the layout completed in LAP # 6 using hand tools and pedestal grinder to within + - 1/32" of specifications

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 7	Bench Metals LAPs 0 - 6	3 Hours

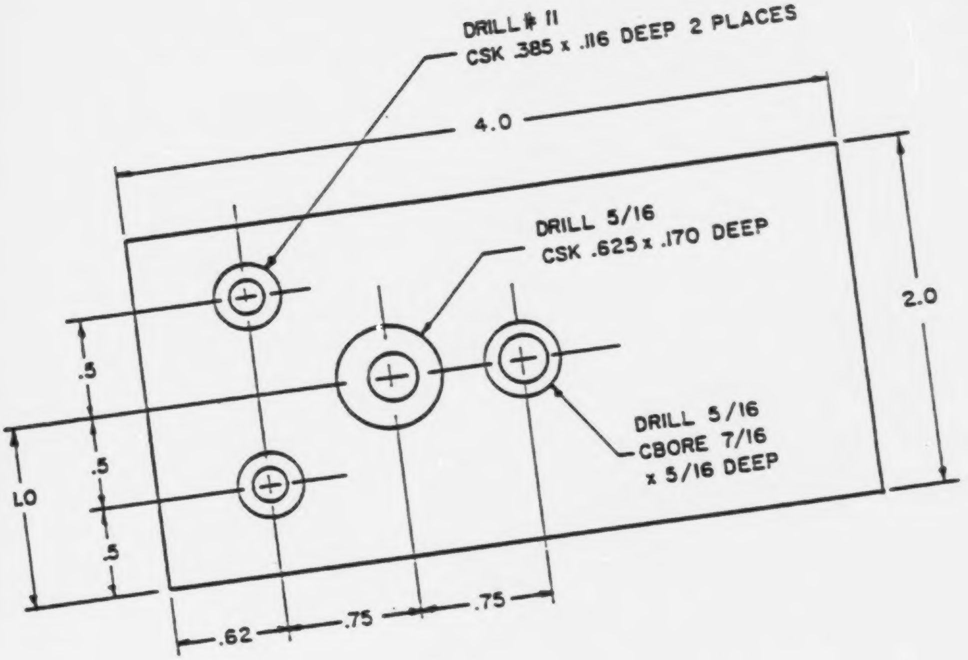
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 7
FABRICATE METAL LAYOUT

1. REVIEW Study sheet
2. GET Video tape "Hacksaw to Layout" and "File to Layout" from cabinet "A", slot 47 **
3. VIEW Video tape footage ____ through ____
4. REWIND Video tape and reset counter
5. RETURN Video tape to cabinet "A", slot # 47 **
6. TAKE Safety test
7. CHECK Safety test
8. TAKE Safety test answers to your INSTRUCTOR
9. READ Job sheet
10. ENTER Shop using SAFETY procedures
11. GET Materials needed
12. DO Job sheet
13. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

14. RETURN All materials to their proper places
15. CLEAN Up your work area
16. GET LAP B M # 8

BENCH METALS


DRILL # 11
CSK .385 x .116 DEEP 2 PLACES
4.0
DRILL 5/16
CSK .625 x .170 DEEP
2.0
DRILL 5/16
CBORE 7/16
x 5/16 DEEP
.5
.5
.5
1.0
.62
.75
.75

LAP # 8

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 8

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Layout Hole Centers

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to safely perform specified layouts for countersinking, counterboring, and hand tapping operations with a drill press. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to read layout specifications and perform layout techniques for hole conditioning within a tolerance o f+ - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 8	Bench Metals LAPs 0 - 7	1 Hour

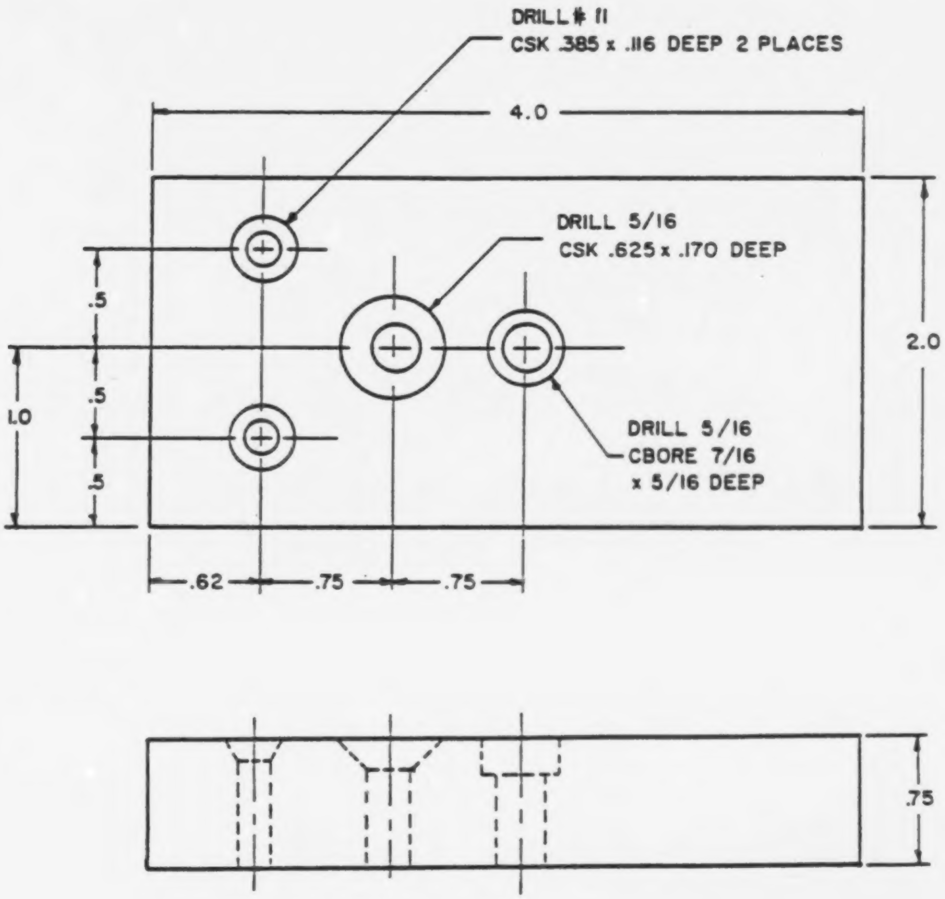
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 8
LAYOUT HOLE CENTERS

1. GET Video tape "Countersink and Counterbore" from cabinet "A", slot # 50 **
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "A", slot # 50 **
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed (steel plate Tray # 15)
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN All materials to their proper places
11. CLEAN Up your work area
12. GET Your initial stamps and a ball peen hammer
13. STAMP Your initials on the backside of your workpiece
14. RETURN Initial stamps and ball peen hammer
15. GET LAP B M # 9

BENCH METALS


DRILL # 11
CSK .385 x .116 DEEP 2 PLACES

DRILL 5/16
CSK .625 x .170 DEEP

DRILL 5/16
CBORE 7/16
x 5/16 DEEP

4.0
2.0
.5
.5
.5
1.0
.62
.75
.75
.75

LAP # 9

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 9

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Counterboring and Countersinking

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to safely perform specified countersinking and counterboring operations. This knowledge will be demonstrated through a study sheet, a safety test (100% required), a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate the ability to read layout specifications, perform countersinking, and counterboring operations within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.

2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 9	Bench Metals LAPs 0 - 8	2 Hours

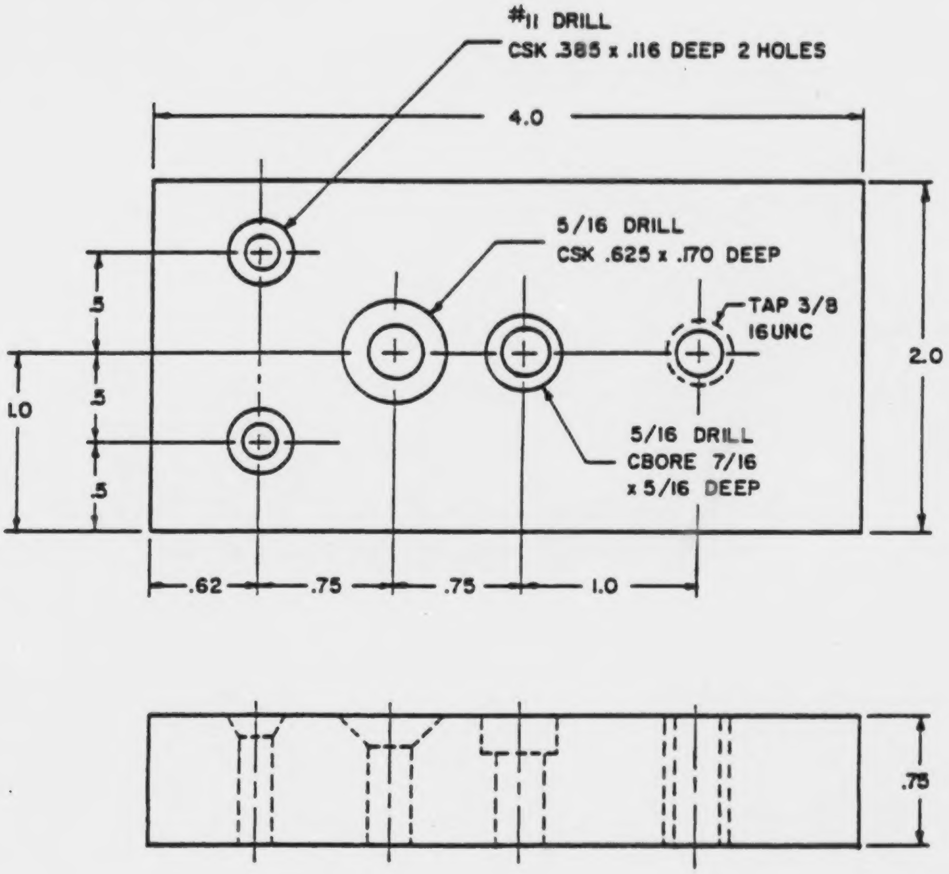
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 9
COUNTERBORING AND COUNTERSINKING

1. GET — Video tape "Countersink and Counterbore" from cabinet "A", slot # 50 **
2. VIEW — Video tape
3. REWIND — Video tape and reset counter
4. RETURN — Video tape to cabinet "A", slot # 50 **
5. REVIEW — Study sheets
6. TAKE — Safety test
7. READ — Job sheet
8. ENTER — Shop using SAFETY procedures
9. GET — All materials needed (using workpiece from LAP # 8)
10. DO — Job sheet
11. SIGNAL — Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN — All materials to their proper places
13. CLEAN — Up your work area
14. GET — LAP B M # 10

BENCH METALS


#11 DRILL
CSK .385 x .116 DEEP 2 HOLES
4.0
5/16 DRILL
CSK .625 x .170 DEEP
TAP 3/8
16UNC
2.0
.5
.5
1.0
.5
5/16 DRILL
CBORE 7/16
x 5/16 DEEP
.62
.75
.75
1.0
.75

LAP # 10

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BENCH METALS LAP # 10

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Bench Metals
LAP Title	Tapping Operation

Performance Objective After completion of this LAP, you should be able to demonstrate the ability to safely perform specified tapping operations. This knowledge will be demonstrated through a study sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate the ability to read layout specifications and perform a tapping operation within a tolerance of + - 1/32"

Reference 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard. Machine Tool Practices, 2nd Edition. John Wiley & Sons. New York, NY. 1982.

LAP #	Prerequisites	Time Range
B M # 10	Bench Metals LAPs 0 - 9	1 Hour

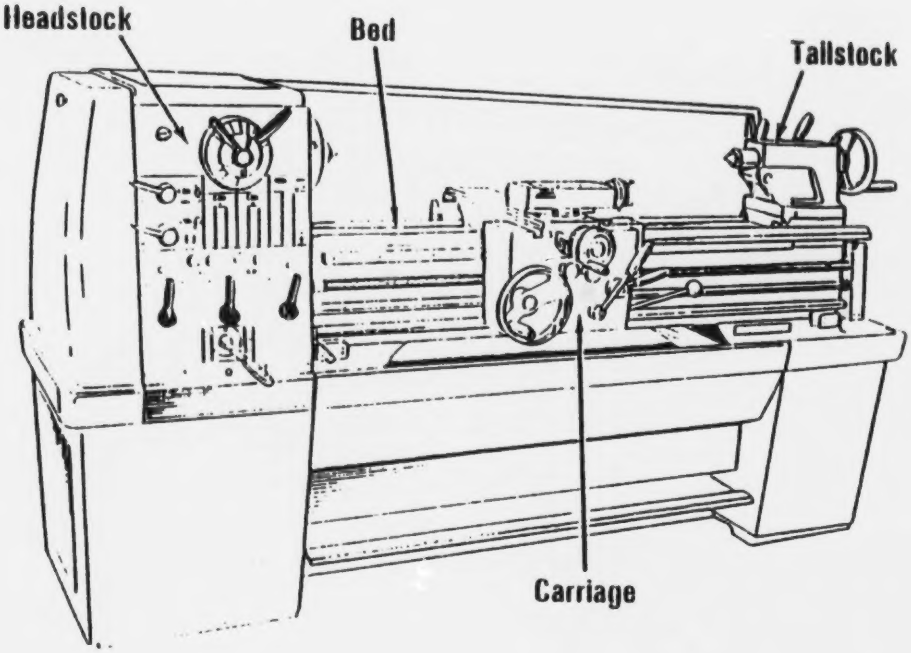
LEARNING ACTIVITY PACKET GUIDE
BENCH METALS
LAP # 10
TAPPING OPERATION

1. GET Video tape "Tap Holes Using Drill Press" from cabinet "A", slot # ____
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. REVIEW Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed (using stock from LAPs # 8 & # 9)
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN All materials to their proper places
11. CLEAN Up your work area
12. SEE Your INSTRUCTOR for your next assignment

LATHE


Headstock
Bed
Tailstock
Carriage

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 0

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	SAFETY and Orientation

Performance Objective After completion of this LAP, you should be able to state safety rules that should be observed, identify lathe parts and accessories, use formulas and charts to calculate speeds and feed, and state proper maintenance procedures when performing lathe work. This knowledge will be demonstrated through study sheets, assignment sheets, a safety test with 100% accuracy, and a unit test with a minimum of 85% accuracy.

Tasks

State safety rules and procedures for using an engine lathe

Identify major parts and accessories of an engine lathe

State rules for care and cleaning of the engine lathe

Use shop formulas and charts to determine lathe speeds, feeds, and depths of cuts

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 0	Orientations Cluster Bench Metal Cluster	3 Hours

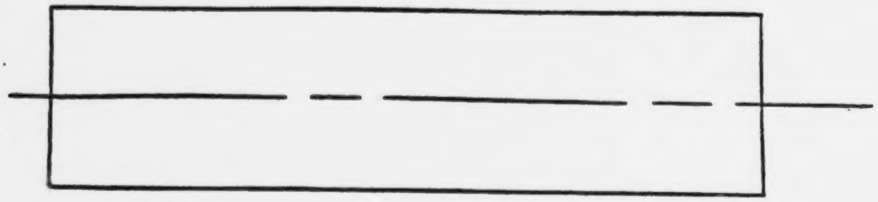
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 0
LATHE SAFETY AND ORIENTATION

1.	GET	Video tape "Safety on South Bend Lathe" located in cabinet "A", slot # 3
2.	VIEW	Video tape
3.	REWIND	Video tape and clear counter on VCR
4.	RETURN	Video tape to cabinet "A", slot # 3
5.	REVIEW	Study sheets, Part 1, pages 3 - 5
6.	COMPLETE	Assignment sheet, Part 1, pages 6 - 7
7.	CHECK	Assignment sheet with answer sheet
8.	REVIEW	Study sheet, Part 2, pages 8 - 14
9.	COMPLETE	Assignment sheet 2, page 15 - 16
10.	GET	Video tape "Operate Lathe Controls" located in cabinet "A", slot # 53 *
11.	VIEW	Video tape footage ____ through ____
12.	REWIND	Video tape
13.	RETURN	Video tape to cabinet "A", slot # 53 *
14.	REVIEW	Study sheets, Part 3 - SAFETY pages 17 - 18
15.	TAKE	Test, page 19
16.	CHECK	Test with answer sheet
17.	SHOW	Your INSTRUCTOR to check your completed SAFETY TEST

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

18.	GET	Lathe LAP # 1

LATHE



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Face to Length

Performance Objective After completion of this LAP, you should be able to safely setup a lathe and face an aluminum stock to specified length. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate the ability to face an aluminum stock to specified length within + - .001 tolerance

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.

LAP #	Prerequisites	Time Range
Lathe # 1	Lathe LAP 0	3 Hours

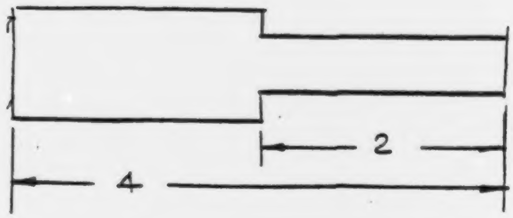
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 1

1. GET Video tape "Perform Facing Operation" from cabinet "A", slot # 53**
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and clear counter
4. RETURN Video tape to cabinet "A", SLOT # 53 **
5. REVIEW Study sheet
6. READ Job sheet
7. ENTER Shop using SAFETY procedures
8. GO To a lathe in machine shop area
9. GET Materials and tools
10. DO Job sheet
11. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN All cleaned tools to their proper place
13. CLEAN Your work area and lathe
14. GET Initials stamps and a ball peen hammer
15. STAMP Workpiece
16. RETURN Initials stamps and ball peen hammer
17. GET Lathe LAP # 2
18. PLACE Your workpiece in your locker for use again in LAP # 2

LATHE



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Straight Turning

Performance Objective After completion of this LAP, you should be able to safely perform a straight turning operations on aluminum stock to specifications. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Perform a straight turning operation on aluminum stock to specifications + - .001 tolerance

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.

LAP #	Prerequisites	Time Range
Lathe # 2	Lathe LAPs 0 & 1	3 Hours

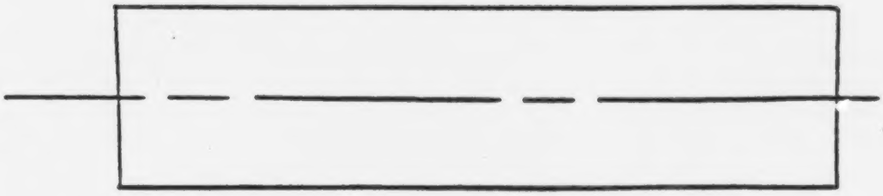
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 2

1. READ Job sheet
2. ENTER Shop using SAFETY procedures
3. GO To lathe in machine shop area
4. DO Job sheet
5. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

6. RETURN All cleaned tools [illegible] their proper place
7. CLEAN Your work area and the lathe
8. STORE Your workpiece in your locker
9. GET LAP # 3

LATHE



LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Face steel part to length

Performance Objective After completion of this LAP, you should be able to safely face a steel part to length. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Face a steel part to specified length within + - .001 tolerance

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 3	Lathe LAPs 0 - 2	3 Hours

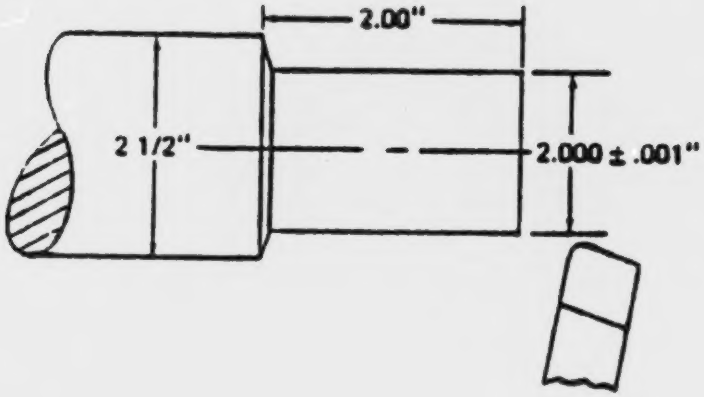
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 3

1.	GET	Video tape "Perform Facing Operation" from cabinet "A", slot # 53 **
2.	VIEW	Video tape footage ____ through ____
3.	REWIND	Video tape and clear counter
4.	RETURN	Video tape to cabinet "A", slot # 53 **
5.	REVIEW	Study sheet
6.	READ	Job sheet
7.	ENTER	Shop using SAFETY procedures
8.	GET	Materials and tools needed from Tray # 18
9.	GO	To lathe in machine shop area
10.	DO	Job sheet
11.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12.	RETURN	All tools to their proper place
13.	CLEAN	Your work area and lathe
14.	GET	Initials stamps and a ball peen hammer
15.	STAMP	Workpiece
16.	RETURN	Initials stamps and ball peen hammer
17.	PLACE	Your workpiece in your locker to use with LAP # 4
18.	GET	Lathe LAP # 4

LATHE


2.00"
2 1/2"
2.000 ± .001"

LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 4

LEARNING ACTIVITY PACKET

Major Instructional Area Machine Shop

Instructional Unit Lathe

LAP Title Straight turning on steel

Performance Objective After completion of this LAP, you should be able to safely perform a straight turning operation on steel to specifications. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform a straight turning operation on steel to specifications within + - .010 tolerance

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 4	Lathe LAPs 0 - 3	3 Hours

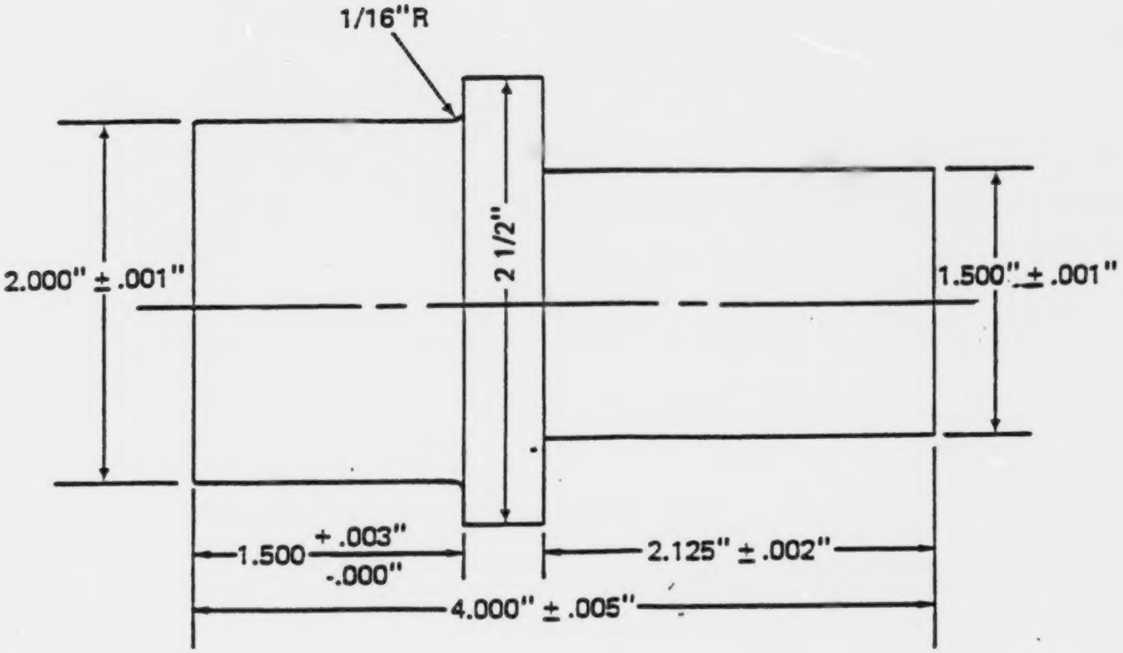
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP #4

1. GET Video tape "Perform Straight Turning" from cabinet "A", slot # 56 **
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clean the VCR
4. RETURN Video tape to cabinet "A", slot # 56 **
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your job sheet
8. GO To a lathe in Machine Shop Area
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place
12. CLEAN Up your work area
13. PLACE Your workpiece in your locker
14. GET Lathe LAP # 5

LATHE


1/16"R
2.000" ± .001"
2 1/2"
1.500" ± .001"
1.500 +.003" -.000"
2.125" ± .002"
4.000" ± .005"

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 5

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Turn Square Shoulder

Performance Objective After completion of this LAP, you should be able to safely turn a part with square shoulder to length. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Turn square shoulder to length as specified within + - .001 tolerance

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 5	Lathe LAPs 0 - 4	3 Hours

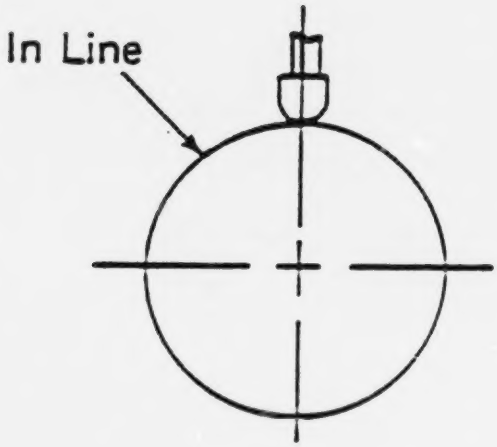
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 5
TURN SQUARE SHOULDER

1. GET Video tape "Turn a Part with Square Shoulder to Length" from cabinet "A", slot # 56**
2. VIEW Video tape from footage through
3. REWIND Video tape and clear the counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your job sheet
8. GO To a lathe in Machine Shop Area
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place
12. CLEAN Up your work area
13. PLACE Your workpiece in your locker, to be used in LAP # 6
14. GET Lathe LAP # 6

LATHE



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 6

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Align Work in Four-Jaw Chuck

Performance Objective After completion of this LAP, you should be able to safely use a dial indicator to align work in a four-jaw chuck. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Use dial indicator to align work in a four-jaw chuck

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 6	Lathe LAPs 0 - 5	3 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 6
ALIGN WORK IN FOUR-JAW CHUCK

1. GET Video tape "Align Work in Four-Jaw Chuck" from cabinet "A", slot # 56**

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and clear the counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials and tools as listed on your job sheet

8. GO To a lathe in Machine Shop Area

9. DO Job sheet

10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

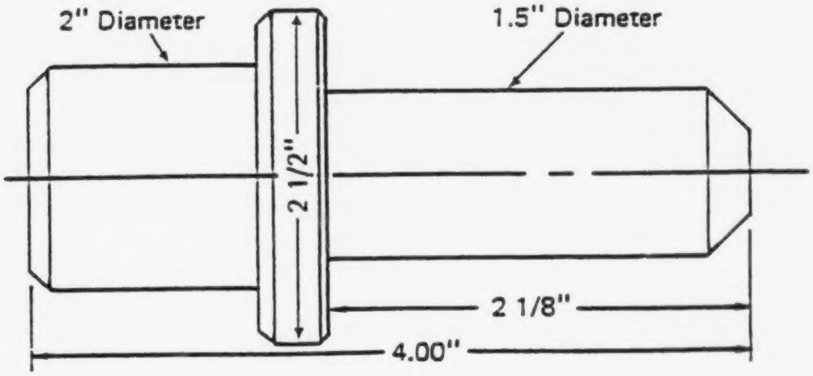
11. RETURN All cleaned tools to their proper place

12. CLEAN Up your work area

13. PLACE Your workpiece in your locker to use in LAP # 7

14. GET Lathe LAP # 7

LATHE


2" Diameter
1.5" Diameter
2 1/2"
2 1/8"
4.00"

LAP # 7

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 7

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Chamfer Operation

Performance Objective After completion of this LAP, you should be able to safely perform chamfer operations to specifications. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform chamfer operations to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 7	Lathe LAPs 0 - 6	3 Hours

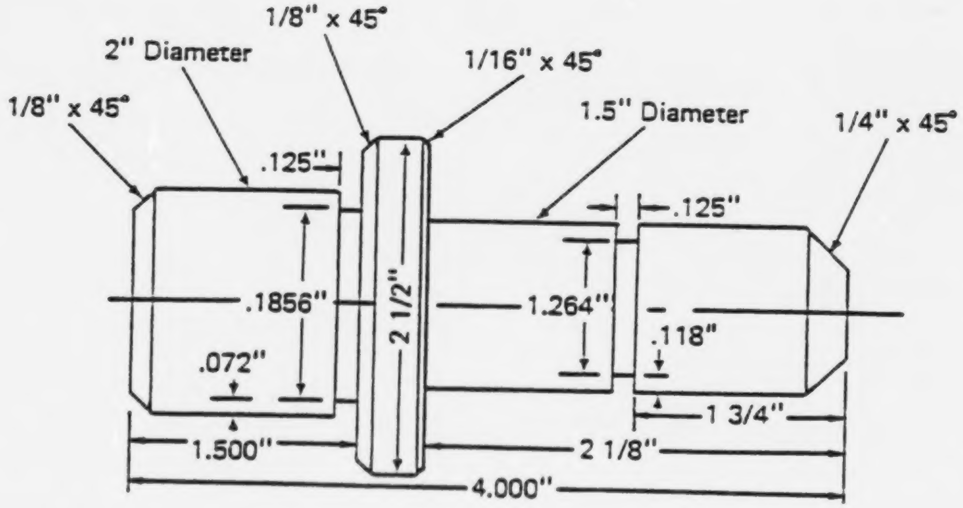
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP #7
CHAMFER OPERATIONS

1. GET Video tape "Perform Chamfer Operation" from cabinet "A", slot # 56**
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clear the counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your job sheet
8. GO To a lathe in Machine Shop Area
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place
12. CLEAN Up your work area
13. PLACE Your workpiece in your locker, to use again in LAP # 8
14. GET Lathe LAP # 8

LATHE


1/8" x 45°
2" Diameter
1/8" x 45°
1/16" x 45°
1.5" Diameter
1/4" x 45°
.125"
.125"
.1856"
2 1/2"
1.264"
.118"
.072"
1 3/4"
1.500"
2 1/8"
4.000"

LAP # 8

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 8

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Recessing Operation

Performance Objective After completion of this LAP, you should be able to safely perform recessing operation to specifications. This knowledge will be demonstrated through a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform recessing operation to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 8	Lathe LAPs 0 - 7	3 Hours

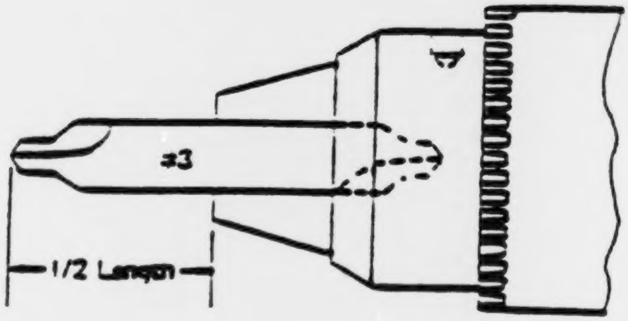
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 8
PERFORM RECESSING OPERATIONS

1. GET Video tape "Perform Recessing Operation" from cabinet "A", slot # 56**
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clear the counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your job sheet
8. GO To a lathe in Machine Shop Area
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place
12. CLEAN Up your work area
13. PLACE Your workpiece in your locker, to use again in LAP # 9
14. GET Lathe LAP # 9

LATHE



LAP # 9

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 9

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Center-drilling

Performance Objective After completion of this LAP, you should be able to safely perform a center-drilling operations to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform center-drilling operations to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 9	Lathe LAPs 0 - 8	3 Hours

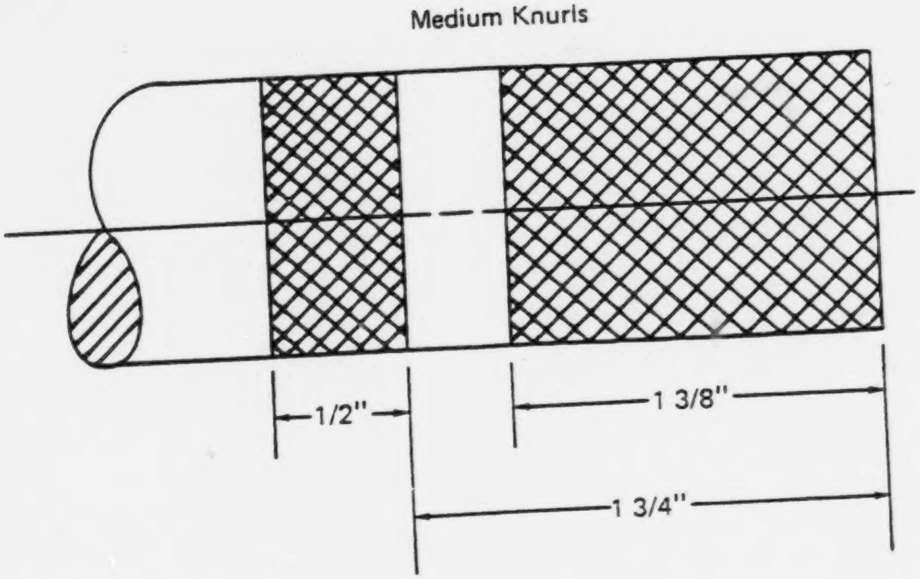
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 9
PERFORM CENTER DRILL OPERATION

1.	GET	Video tape "Facing & Center Drilling" located in cabinet "A", slot # 4*
2.	VIEW	Video tape from footage ____ through ____
3.	REWIND	Video tape and clear the counter
4.	RETURN	Video tape to cabinet
5.	READ	Job sheet
6.	GET	Video tape "Perform Center Drill Operation" from cabinet "A", slot # 59*
7.	VIEW	Video tape from footage ____ through ____
8.	REWIND	Video tape and clear counter
9.	RETURN	Video tape to cabinet
10.	ENTER	Shop using SAFETY procedures
11.	GET	Materials and tools as listed on your job sheet
12.	GO	To a lathe in Machine Shop Area
13.	DO	Job sheet
14.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

15.	RETURN	All cleaned tools to their proper place
16.	CLEAN	Up your work area
17.	PLACE	Your workpiece in your locker, as you will use it again in LAP # 18
18.	GET	Lathe LAP # 10

LATHE


Medium Knurls
1/2"
1 3/8"
1 3/4"

LAP # 10

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 10

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Knurling

Performance Objective After completion of this LAP, you should be able to safely perform knurling operation to specification. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform knurling operation to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 10	Lathe LAPs 0 - 9	3 Hours

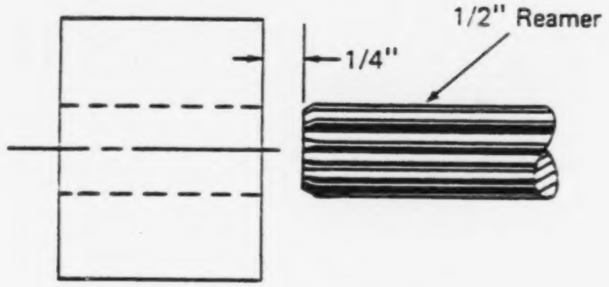
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 10
KNURLING

1. GET Video tape "Facing & Center Drilling" from cabinet "A", slot # 4*
2. VIEW Video tape from footage through
3. REWIND Video tapes and clear the counter
4. RETURN Video tapes to cabinet
5. READ Job sheet
6. GET Video tape "Perform A Knurling Operation" from cabinet "A", slot # 59*
7. VIEW Video tape from footage ____ through ____
8. REWIND Video tape and reset counter
9. RETURN Video tape to cabinet
10. ENTER Shop using SAFETY procedures
11. GET Materials and tools as listed on your job sheet
12. GO To a lathe in Machine Shop Area
13. DO Job sheet
14. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

15. RETURN All cleaned tools to their proper place
16. CLEAN Up your work area
17. GET Initial stamps and ball peen hammer
18. STAMP Your initials on workpiece
19. RETURN Initial stamps and ball peen hammer
20. PLACE Your workpiece in your locker
21. GET Lathe LAP # 11

LATHE


1/2" Reamer
1/4"

LAP # 11

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 11

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Drilling and Reaming

Performance Objective After completion of this LAP, you should be able to safely perform drilling and reaming operations to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Perform drilling and reaming operations to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 11	Lathe LAPs 0 - 10	1 1/2 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 11
DRILLING AND REAMING

1. GET Video tape "Drill and Ream A Hole" from cabinet "A", slot # 59*

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and clear the counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials and tools as listed on your job sheet

8. GO To a lathe in Machine Shop Area

9. DO Job sheet

10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place

12. CLEAN Up your work area

13. GET Initial stamps and ball peen hammer

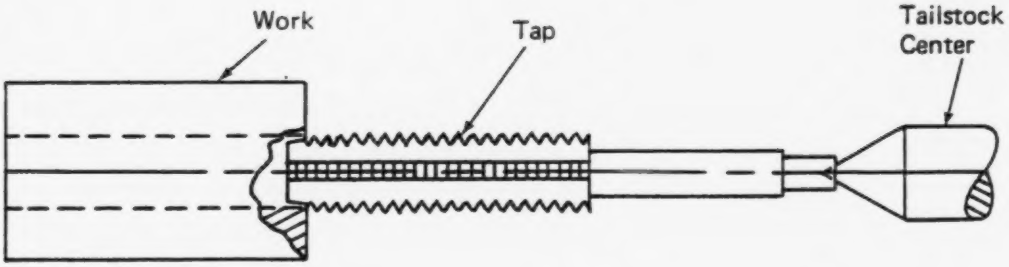
14. STAMP Your initials on workpiece

16. RETURN Initial stamps and ball peen hammer

17. PLACE Your workpiece in your locker

18. GET Lathe LAP # 12

LATHE


Work
Tap
Tailstock
Center

LAP # 12

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 12

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Tapping

Performance Objective After completion of this LAP, you should be able to safely perform tapping operations to specification. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform tapping operation to specification

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 12	Lathe LAPs 0 - 11	1-1/2 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 12
TAPPING

1. GET Video tape "Using Lathe Center to Align and Start A Tap" from cabinet "A", slot # 59*

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and clear the counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials and tools as listed on your job sheet

8. GO To a lathe in Machine Shop Area

9. DO Job sheet

10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place

12. CLEAN Up your work area

13. GET Initial stamps and ball peen hammer

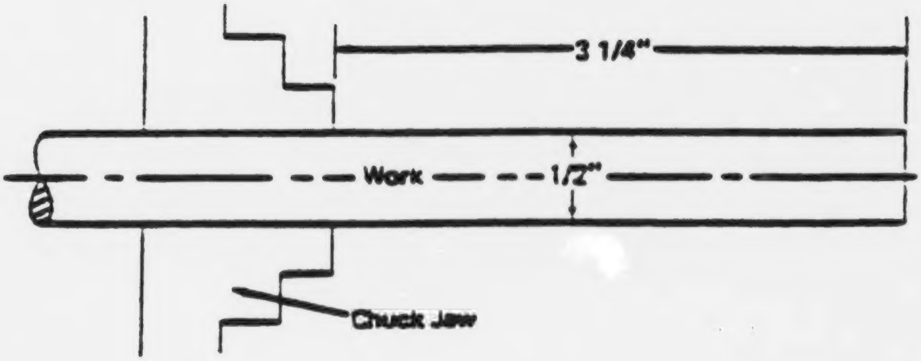
14. STAMP Your initials on workpiece

16. RETURN Initial stamps and ball peen hammer

17. PLACE Your workpiece in your locker

18. GET Lathe LAP # 13

LATHE


3 1/4"
Work
1/2"
Chuck Jaw

LAP # 13

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 13

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Cut-off Operation
Performance Objective	After completion of this LAP, you should be able to safely perform cut-off operation to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform cut-off operation to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 13	Lathe LAPs 0 - 12	1-1/2 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 13
CUT-OFF OPERATION

1. GET Video tape "Perform Cut-Off Operation" from cabinet "A", slot # 59*

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and clear the counter

4. RETURN Video tape to cabinet "A", slot # 59 *

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials and tools as listed on your job sheet

8. GO To a lathe in Machine Shop Area

9. DO Job sheet

10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place

12. CLEAN Up your work area

13. GET Initial stamps and ball peen hammer

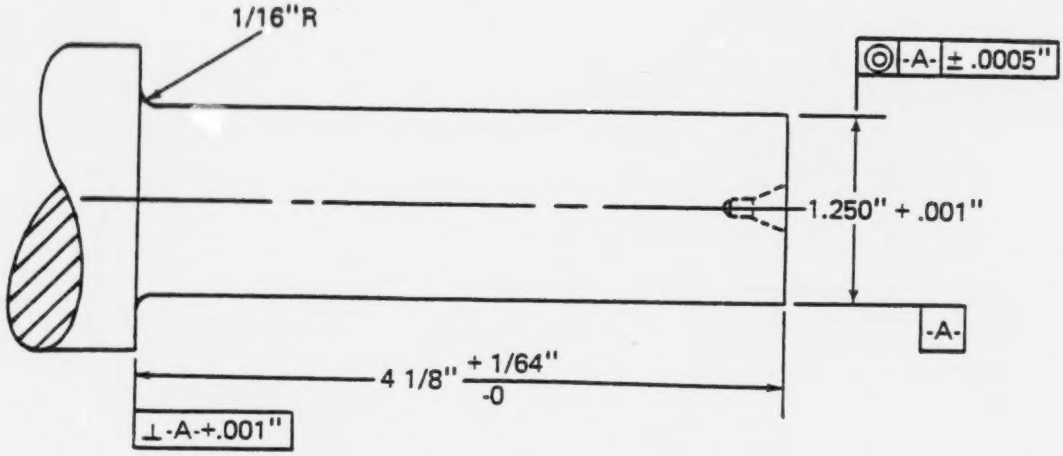
14. STAMP Your initials on workpiece

16. RETURN Initial stamps and ball peen hammer

17. PLACE Your workpiece in your locker

18. GET Lathe LAP # 14

LATHE


1/16"R
◎ -A- ± .0005"
1.250" + .001"
-A-
4 1/8" + 1/64" -0
⊥ -A- +.001"

LAP # 14

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 14

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Turning Between Centers

Performance Objective After completion of this LAP, you should be able to safely perform turning between centers operation to specifications. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform turning between centers operation to specifications

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

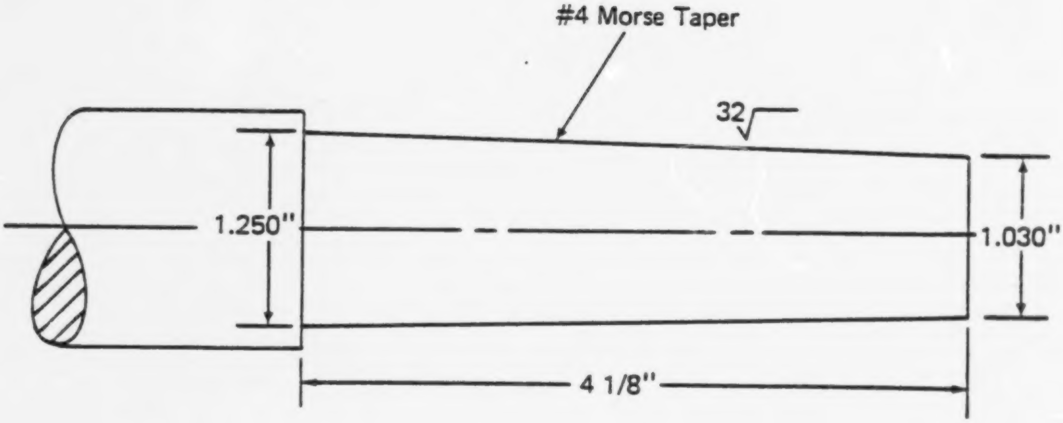
LAP #	Prerequisites	Time Range
Lathe # 14	Lathe LAPs 0 - 13	3 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 14
TURNING BETWEEN CENTERS

1. GET Video tape "Turning Between Centers" from cabinet "A", slot # 4 **
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clear counter
4. RETURN Video tape to cabinet
5. GET Video tape "Aligning Tail Stock-lathe" from cabinet "A", slot # 17 **
6. VIEW Video tape from footage ____ through ____
7. REWIND Video tape and clear counter
8. RETURN Video tape to cabinet
9. GET Video tape "Turn Between Center" from cabinet "A", slot # 59 **
10. VIEW Video tape from footage ____ through ____
11. REWIND Video tapes and clear the counter
12. RETURN Video tapes to cabinet
13. READ Job sheet
14. ENTER Shop using SAFETY procedures
15. GET Materials and tools as listed on your job sheet
16. GO To a lathe in Machine Shop Area
17. DO Job sheet
18. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

19. RETURN All cleaned tools to their proper place
20. CLEAN Up your work area
21. GET Initial stamps and ball peen hammer
22. STAMP Your initials on workpiece
23. RETURN Initial stamps and ball peen hammer
24. PLACE Your workpiece in your locker, for use in LAP # 15
25. GET Lathe LAP # 15


#4 Morse Taper
32
1.250"
1.030"
4 1/8"

LAP # 15

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 15

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Turning Taper with Taper Attachment

Performance Objective After completion of this LAP, you should be able to safely perform a taper cut with taper attachment. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform a taper cut with taper attachment

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 15	Lathe LAPs 0 - 14	4-1/2 Hours

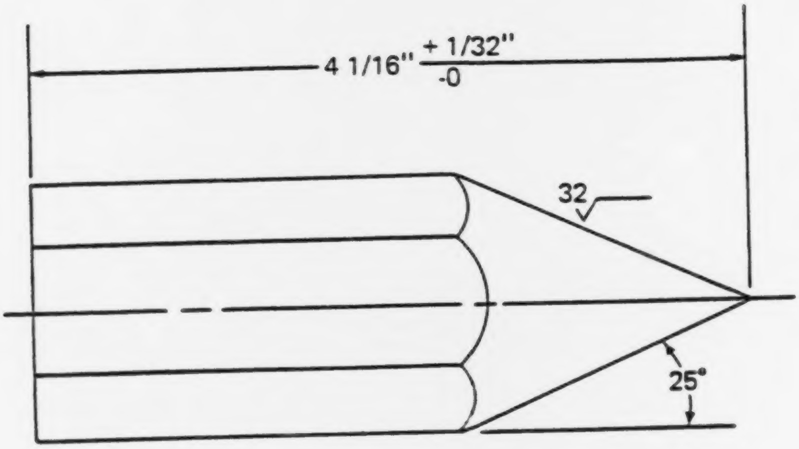
LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 15
TURNING TAPER WITH TAPER ATTACHMENT

1. GET Video tape "Cutting Tapers-Compound Rest" from cabinet "A", slot 5**
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clear counter
4. RETURN Video tape to cabinet
5. GET Video tape "Cutting Tapers - of Tailstock" from cabinet "A", slot 13**
6. VIEW Video tape from footage ____ through ____
7. REWIND Video tape and clear the counter
8. RETURN Video tape to cabinet
9. READ Job sheet
10. GET Video tape "Turn a Tap with A Taper Attachment" from cabinet "A", slot # 59**
11. VIEW Video tape from footage ____ through ____
12. REWIND Video tape and clear counter
13. RETURN Video tape to cabinet
14. ENTER Shop using SAFETY procedures
15. GET Materials and tools as listed on your job sheet
16. GO To a lathe in Machine Shop Area
17. DO Job sheet
18. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

19. RETURN All cleaned tools to their proper place
20. CLEAN Up your work area
24. PLACE Your workpiece in your locker
25. GET Lathe LAP # 16

LATHE


4 1/16" + 1/32" -0
32
25°

LAP # 16

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 16

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Turn Taper with a Compound

Performance Objective After completion of this LAP, you should be able to safely perform taper turning with a compound to specifications. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform taper turning with a compound to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 16	Lathe LAPs 0 - 15	3 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 16
TURN TAPER WITH A COMPOUND

1. GET Video tape "Turn A Taper with A Compound" from cabinet "A", slot # 59**

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and clear the counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials and tools as listed on your job sheet

8. GO To a lathe in Machine Shop Area

9. DO Job sheet

10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place

12. CLEAN Up your work area

13. GET Initial stamps and ball peen hammer

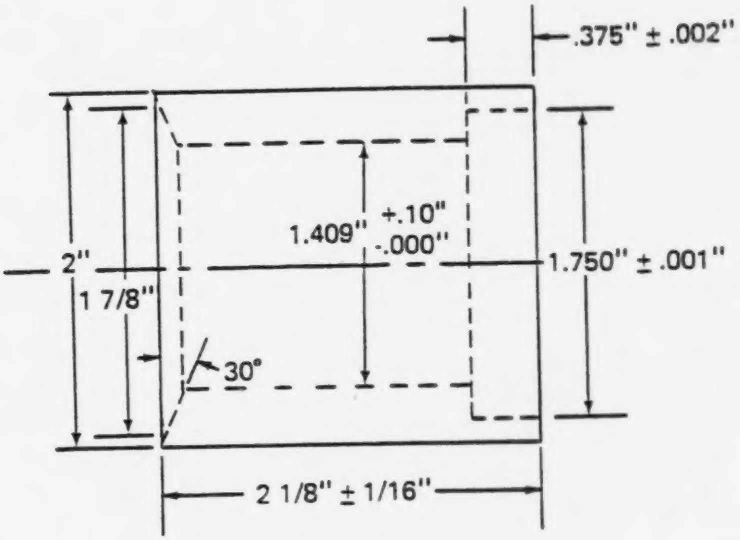
14. STAMP Your initials on workpiece

16. RETURN Initial stamps and ball peen hammer

17. PLACE Your workpiece in your locker

18. GET Lathe LAP # 17

LATHE


.375" ± .002"
2"
1 7/8"
1.409" +.10" -.000"
1.750" ± .001"
30°
2 1/8" ± 1/16"

LAP # 17

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 17

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Boring Operation

Performance Objective After completion of this LAP, you should be able to safely perform boring operations to specifications. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform a boring operation to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 17	Lathe LAPs 0 - 16	3 Hours

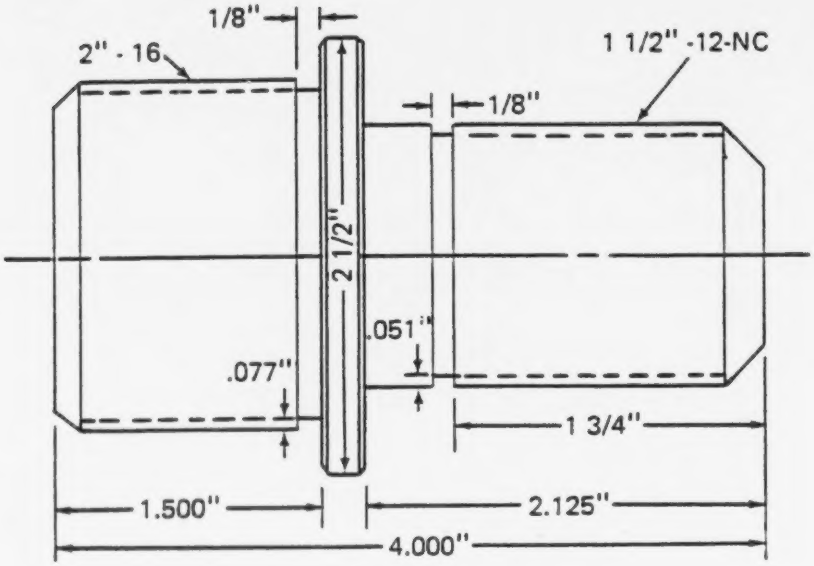
[illegible]RNING ACTIVITY PACKET GUI[illegible]
LATHE
LAP # 17
BORING OPERATION

1. GET Video tape "Perform Boring Operation" from cabinet "A", slot # 59**
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and clear the counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your job sheet
8. GO To a lathe in Machine Shop Area
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All cleaned tools to their proper place
12. CLEAN Up your work area
13. GET Initial stamps and ball peen hammer
14. STAMP Your initials on workpiece
16. RETURN Initial stamps and ball peen hammer
17. PLACE Your workpiece in your locker
18. GET Lathe LAP # 18

LATHE


1/8"
2" - 16
1 1/2" -12-NC
1/8"
2 1/2"
.051"
.077"
1 3/4"
1.500"
2.125"
4.000"

LAP # 18

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 18

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Cut External Threads to A Relief
Performance Objective	After completion of this LAP, you should be able to safely cut external threads to a relief as specified. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Cut external threads to a relief as specified

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 18	Lathe LAPs 0 - 17	3 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 18
CUT EXTERNAL THREADS TO A RELIEF

1. GET Video tape "External Threading on Lathe" from cabinet "A", slot # 8*

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tapes and clear the counter

4. RETURN Video tape to cabinet

5. GET Video tape "Lathe-cutting Threads with Die" from cabinet "A". slot # 16**

6. VIEW Video tape from footage ____ through ____

7. REWIND Video tape and clear counter

8. RETURN Video tape to cabinet

9. READ Job sheet

10. GET Video tape "Cut External Threads to A Relief" from cabinet "A", slot # 62*

11. VIEW Video tape from footage ____ through ____

12. REWIND Video tape

13. RETURN Video tape to cabinet

14. ENTER Shop using SAFETY procedures

15. GET Materials and tools as listed on your job sheet

16. GO To a lathe in Machine Shop Area

17. DO Job sheet

18. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

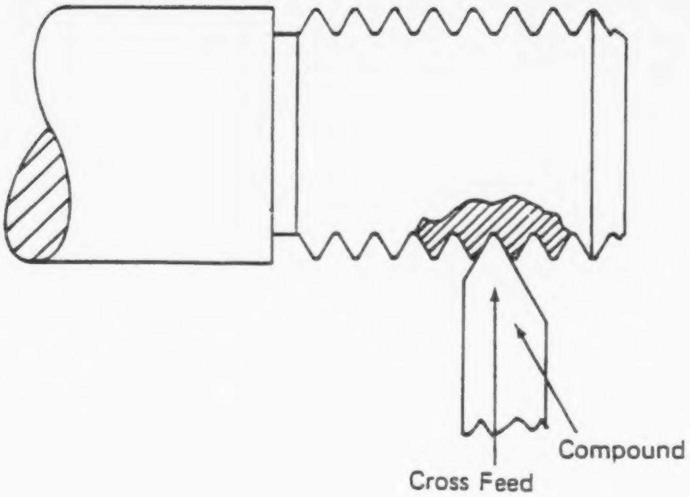
19. RETURN All cleaned tools to their proper place

20. CLEAN Up your work area

24. PLACE Your workpiece in your locker

25. GET Lathe LAP # 19

LATHE


Compound
Cross Feed

LAP # 19

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 19

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Pick Up Threads

Performance Objective After completion of this LAP, you snould be able to safely perform thread pick up to specification. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform thread pick up to specification

References 1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.

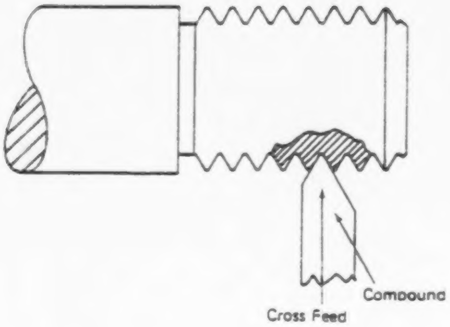
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.

3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.

4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 19	Lathe LAPs 0 - 18	1-1/2 Hours

LATHE
LAP # 19
JOB SHEET
PICK UP THREADS



I. Equipment and materials

Right-hand threading tool

Center gauge

Steel rule, 6"

Lathe with four-jaw chuck

Quick-change tool post and toolholder

Threaded stud, 1.0", from Tray # ___

II. Procedure

(NOTE: This procedure may be required on a bolt that has damaged threads, or when a threading tool is removed, sharpened, and put back in toolholder.)

A. Check all oil levels and perform daily maintenance

B. Set compound 30 degrees to right of cross feed

C. Set lathe speed

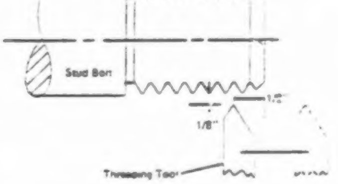
D. Chuck bolt and align

E. Mount threading tool in toolholder, adjust center height, and use center gauge to square tool to axis of bolt

F. Set carriage controls to cut eight (8) threads per inch

G. Move carriage to right so that tool clears end of bolt 1/8" from work

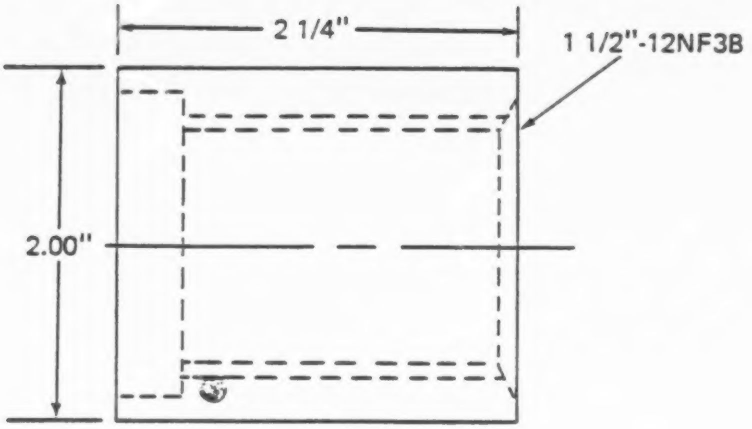
FIGURE 1



H. Start spindle and engage half-nut lever; allow tool to travel to left until it is about 1/2" to the left of end of bolt; stop spindle (Figure 1)

(NOTE: Do NOT disengage the half-nut lever yet.)

LATHE


2 1/4"
1 1/2"-12NF3B
2.00"

LAP # 20

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
LATHE LAP # 20

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Lathe
LAP Title	Cut Internal Threads

Performance Objective After completion of this LAP, you should be able to safely perform internal thread cutting to specifications. This knowledge will be demonstrated through a job sheet, an evaluation sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform internal thread cutting to specifications

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - South Bend Lathe. How to Run. Amsted Industries, 56th Ed. 1966. Southbend, IN.
3 - S. F. Krar & J. W. Oswald. Turning Technology Engine & Turret Lathes. Delmar Publications. 1976. Albany, NY.
4 - RMI., Video Tape. Safety on South Bend Lathe. Kansas City, MO.

LAP #	Prerequisites	Time Range
Lathe # 20	Lathe LAPs 0 - 19	4-1/2 Hours

LEARNING ACTIVITY PACKET GUIDE
LATHE
LAP # 20
CUT INTERNAL THREADS

1.	GET	Video tape "Internal Threading - Lathe" from cabinet "A", slot 17*
2.	VIEW	Video tape from footage ____ through ____
3.	REWIND	Video tape and clear the counter
4.	RETURN	Video tape to cabinet
5.	READ	Job sheet
6.	GET	Video tape "Cut Internal Threads" from cabinet "A", slot # 62**
7.	VIEW	Video tape from footage ____ through ____
8.	REWIND	Video tape and clear the counter
9.	RETURN	Video tape to cabinet
10.	READ	Job sheet
11.	ENTER	Shop using SAFETY procedures
12.	GET	Materials and tools as listed on your job sheet
13.	GO	To a lathe in Machine Shop Area
14.	DO	Job sheet
15.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

16.	RETURN	All cleaned tools to their proper place
17.	CLEAN	Up your work area
18.	GET	Initial stamps and ball peen hammer
19.	STAMP	Your initials on workpiece
20.	RETURN	Initial stamps and ball peen hammer
21.	PLACE	Your workpiece in your locker
22.	SEE	YOUR INSTRUCTOR FOR YOUR NEXT AREA OS ASSIGNMENT

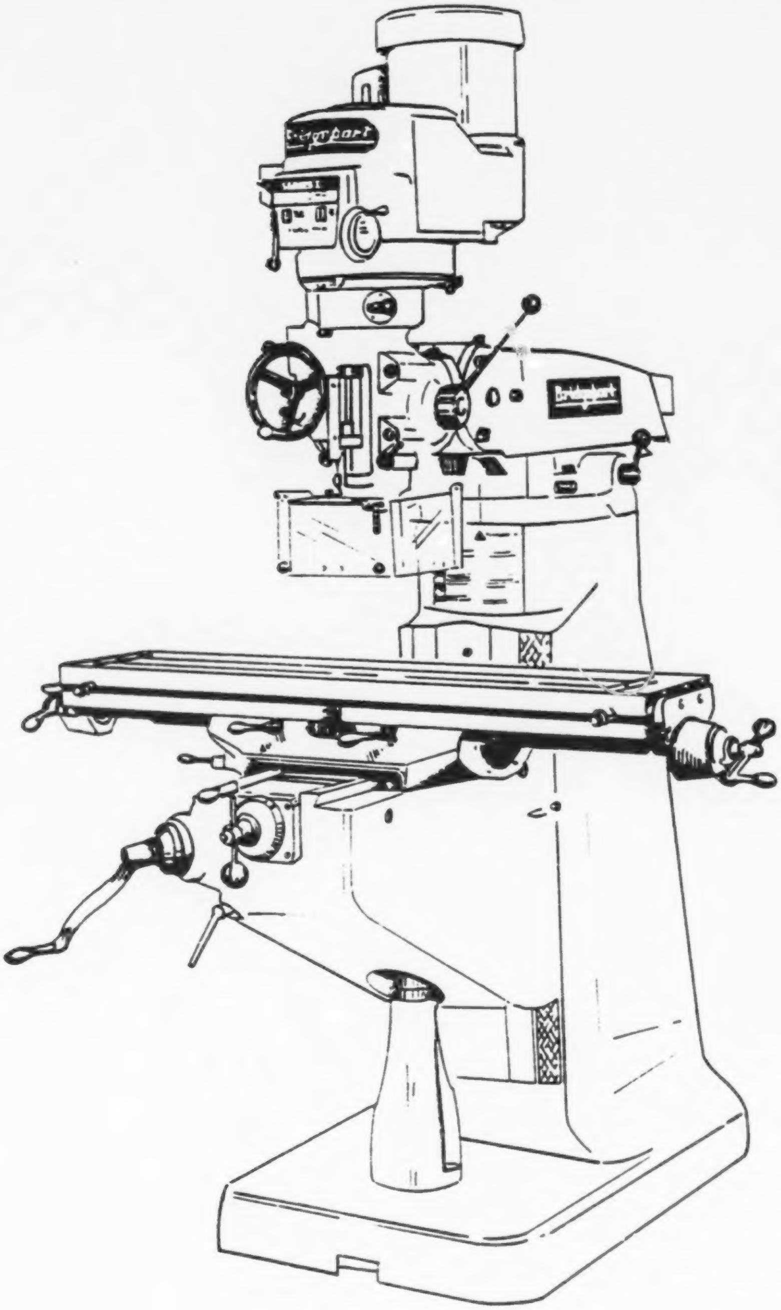
VERTICAL MILL

HORIZONTAL MILL

SURFACE GRINDING

BROACHING

VERTICAL MIL


Bridgeport
Bridgeport

LAP # 0

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 0

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	SAFETY

Performance Objective After completion of this LAP, you should be able to state safety and operational procedures for the vertical milling machine. This knowledge will be demonstrated through an assignment sheet, a safety test (100% required), a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate knowledge of safety procedures regarding vertical milling.

Identify vertical milling machine controls

Define vertical milling operations

References

1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK

2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY

3 - Krar, S. F., Oswald, J. W., Amand, J. e., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

4 - RMI., Video Tape, "Mill Safety" and "Basic Milling Procedures", Kansas City, MO.

LAP #	Prerequisites	Time Range
V. MILL 0	Bench Metals LAPs 0 - 10 Lathe LAPs 0 - 9	1/2 Hour

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 0
SAFETY

1. GET Video tape RMI - "Basic Milling Procedures" from cabinet "A", slot # 9 **

2. VIEW Video tape

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. REVIEW Study sheets

6. COMPLETE Assignment sheets

7. CHECK Assignment sheets

8. GET Video tape "Mill Safety" from cabinet "A", slot # 9 *

9. VIEW Video tape

10. REWIND Video tape and reset counter

11. RETURN Video tape to cabinet

12. TAKE SAFETY TEST

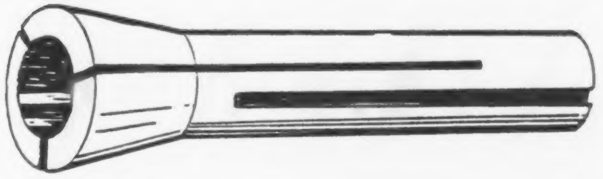
13. CHECK Safety Test

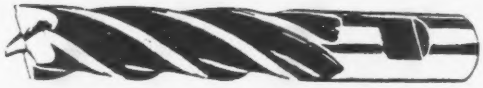
14. GO To your INSTRUCTOR with your Safety Test Answers

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

15. GET LAP V. Mill # 1

VERTICAL MILL





LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Cutter Holder

Performance Objective After completion of this LAP, you should be able to mount and remove cutter and cutter holder. This knowledge will be demonstrated through an assignment sheet, a job sheet and a unit test with a minimum of 855 accuracy.

Task

Mount and remove cutter and cutter holder as specified

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 1	V. Mill LAP 0	1/2 Hour

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 1
CUTTER HOLDER

1. GET — Video tape "Mount & Remove Cutter & Cutter Holders" from cabinet "A", slot # 68 **
2. VIEW — Video tape from footage ____ through ____
3. REWIND — Video tape and reset counter
4. RETURN — Video tape to cabinet
5. REVIEW — Study sheet
6. READ — Job sheet
7. ENTER — Shop using SAFETY procedures
8. GET — Materials needed
9. DO — Job sheet
10. SIGNAL — Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN — All materials to their proper places
12. CLEAN — Up your work area
13. GET — LAP V. Mill # 2

VERTICAL MILL

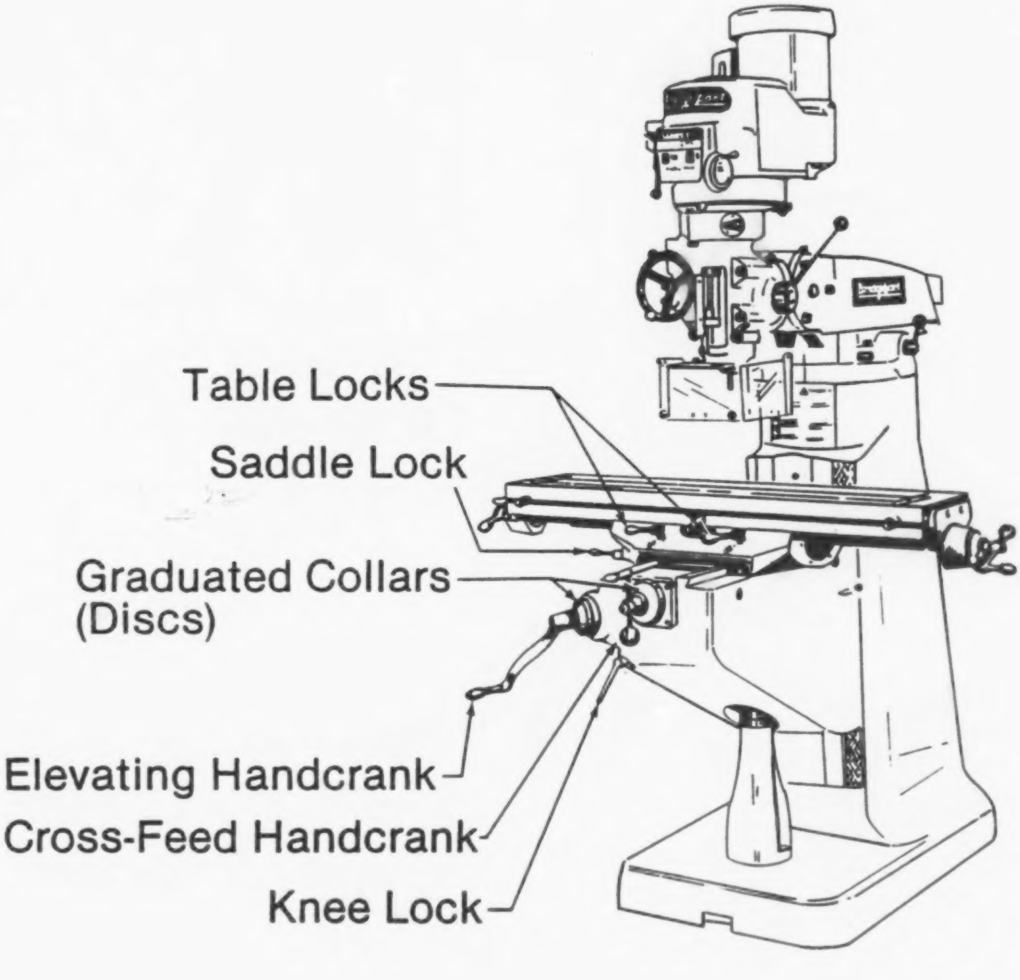


Table Locks
Saddle Lock
Graduated Collars (Discs)
Elevating Handcrank
Cross-Feed Handcrank
Knee Lock

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Machine Controls

Performance Objective After completion of this LAP, you should be able to operate vertical milling machine controls. This knowledge will be demonstrated through an assignment sheet, a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate use of specified machine controls

References 1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK

2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY

3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 2	V. Mill LAPs 0 & 1	1/4 Hour

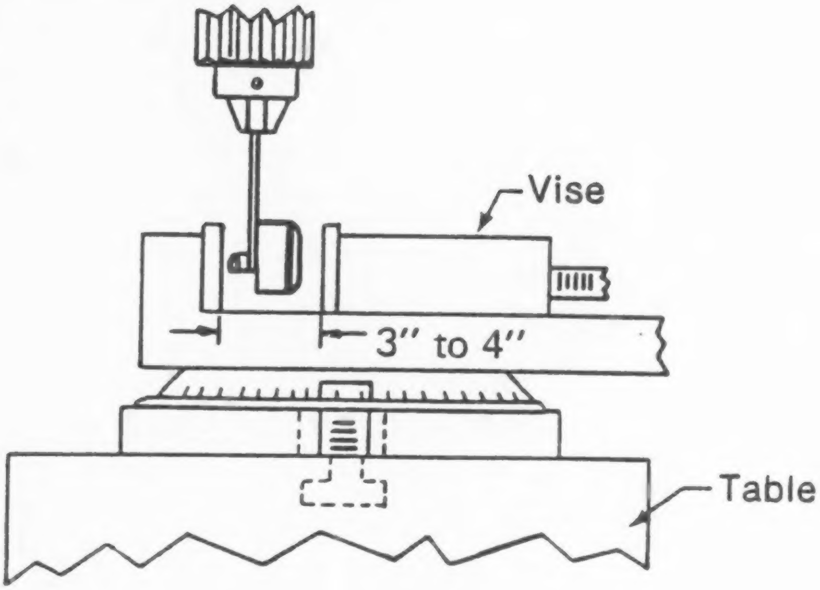
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 2
MACHINE CONTROLS

1.	GET	Video tape "Use Machine Controls Properly" from cabinet "A", slot # 68 **
2.	VIEW	Video tape from footage ____ through ____
3.	REWIND	Video tape and reset counter
4.	RETURN	Video tape to cabinet
5.	READ	Job sheet
6.	ENTER	Shop using SAFETY procedures
7.	GET	All materials needed
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11.	RETURN	All materials to their proper places
12.	CLEAN	Your work area
13.	GET	LAP V. Mill # 3

VERTICAL MILL


Vise
3" to 4"
Table

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Mount and Align Vise

Performance Objective After completion of this LAP, you should be able to properly mount and align a vise. This knowledge will be demonstrated through an assignment sheet, a job sheet and a unit test with a minimum of 85% accuracy.

Task

Mount and align a vise as specified to within a + - .001 tolerance

References 1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 3	V. Mill LAPs 0, 1, & 2	1/4 Hour

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 3
MOUNT AND ALIGN VISE

1. GET Video tape "Mount & Align Vise" from cabinet "A", slot # 68 **

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET Materials needed

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your completed work

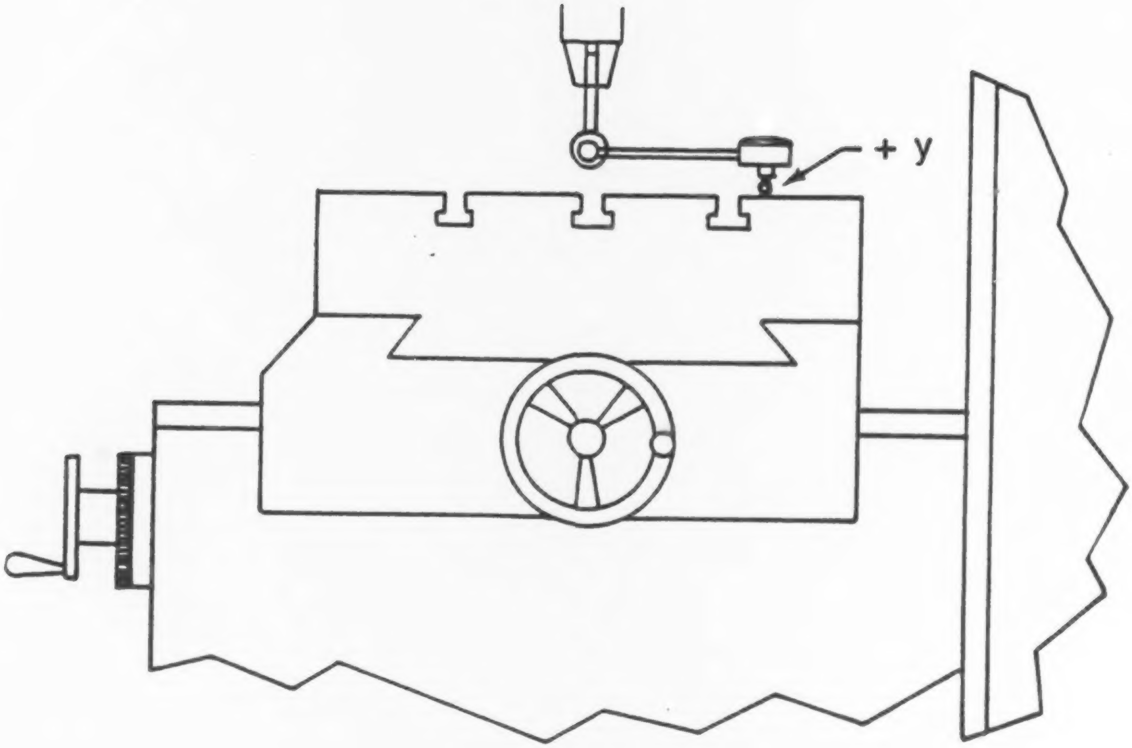
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN Materials to their proper places

11. CLEAN Up your work area

12. GET LAP V. Mill # 4

VERTICAL MILL



LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 4

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Align Head Square to Table

Performance Objective After completion of this LAP, you should be able to align head square to mill table. This knowledge will be demonstrated through an assignment sheet, a job sheet and a unit test with a minimum of 85% accuracy.

Task

Align head square to table as specified to within + - .001 tolerance

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 4	V. Mill LAPs 0 - 3	1/4 Hour

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 4
ALIGN HEAD SQUARE TO TABLE

1. GET Video tape "Align Head Square to Table" from cabinet "A", slot # 68 **

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

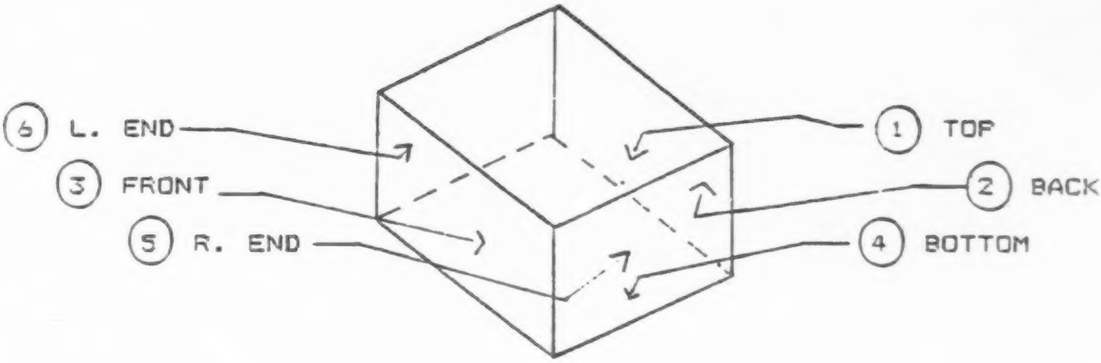
7. DO Job sheet

8. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

9. GET LAP V. Mill # 5

VERTICAL MILL


⑥ L. END
③ FRONT
⑤ R. END
① TOP
② BACK
④ BOTTOM

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 5

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Square Stock to Size

Performance Objective After completion of this LAP, you should be able to safely square aluminum stock to size as specified. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate squaring aluminum stock to size as specified

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 5	V. Mill LAPs 0 - 4	3 Hours

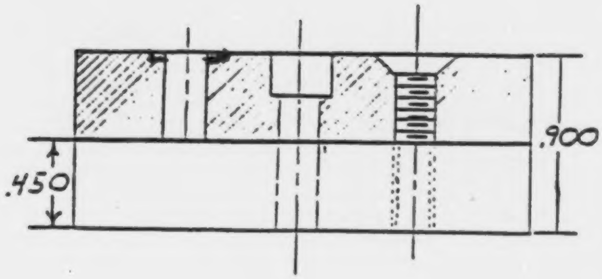
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 5
SQUARE ALUMINUM STOCK TO SIZE

1. REVIEW Study sheets
2. READ Job sheet
3. ENTER Shop using SAFETY procedures
4. GET Materials and tools needed
5. DO Job sheet
6. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7. RETURN Materials and tools to their proper places
8. CLEAN Up your work area
9. GET Your initial stamps and a ball peen hammer
10. STAMP Your initials on the bottom of squared stock
11. RETURN Initial stamps and ball peen hammer
12. STORE Workpiece in your locker (you will use it in LAP # 6)
13. GET LAP V. Mill # 6

VERTICAL MILL



LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 6

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Hole Conditioning

Performance Objective After completion of this LAP, you should be able to perform hole conditioning to specifications. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy

Task

Perform hole conditioning to specifications

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 6	V. Mill LAP 0 - 5	4-1/2 Hours

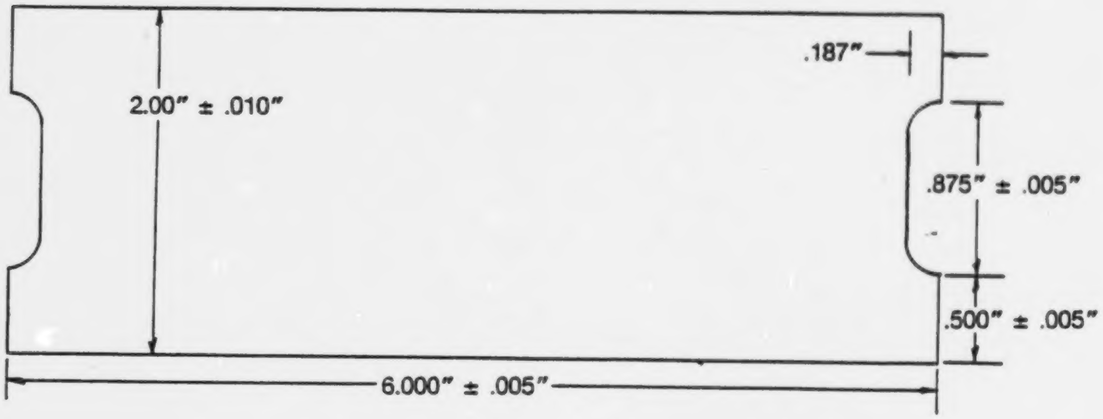
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 6
HOLE CONDITIONING

1. REVIEW Study sheets
2. READ Job sheet
3. ENTER Shop using SAFETY procedures
4. GET Materials and tools needed
5. DO Job sheet
6. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7. RETURN All materials and tools to their proper places
8. CLEAN Up your work area
9. GET LAP V. Mill # 7

VERTICAL MILL


2.00" ± .010"
.187"
.875" ± .005"
.500" ± .005"
6.000" ± .005"

LAP # 7

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 7

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Side Milling

Performance Objective After completion of this LAP, you should be able to perform side milling to specifications. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform specified side milling operation to within + - .010 tolerance

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill -7	V. Mill LAPs 0 - 4	3 Hours

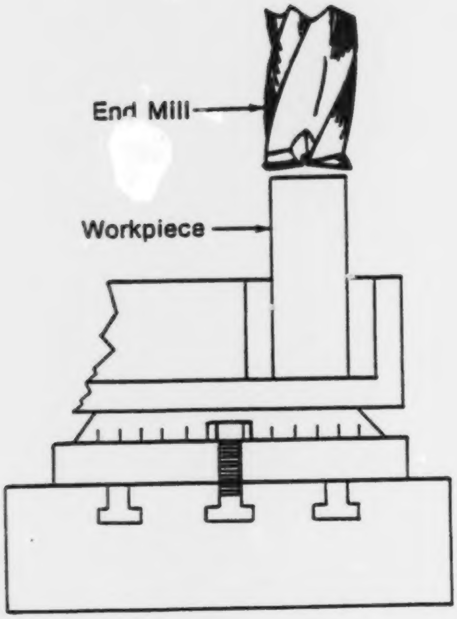
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 7
SIDE MILLING

1. GET Video tape "Perform Side Milling Operations" from cabinet "A", slot # 71 *
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN Materials and tools to their proper places
11. CLEAN Up your work area
12. GET Your initial stamps and a ball peen hammer
13. STAMP Your initials on your workpiece
14. RETURN Your initial stamps and ball peen hammer
15. STORE Your workpiece in your locker
16. GET LAP V. Mill # 8

VERTICAL MILL


End Mill
Workpiece

LAP # 8

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 8

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	End Milling

Performance Objective After completion of this LAP, you should be able to perform end milling operation to specifications. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform end milling operation to specifications within + - .010 tolerance

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

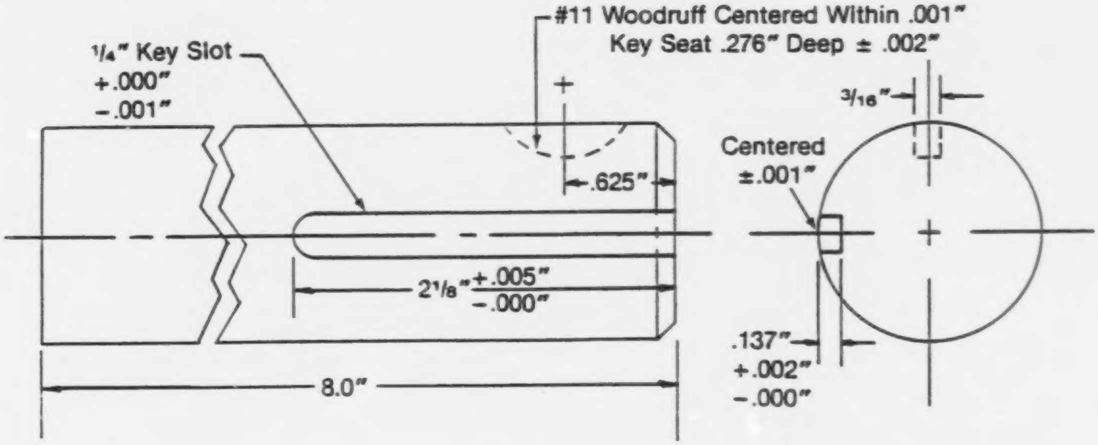
LAP #	Prerequisites	Time Range
V. Mill - 8	V. Mill LAPs 0 - 7	3 Hours

[illegible]EARNING ACTIVITY PACKET G[illegible]E
VERTICAL MILLING
LAP # 8
END MILLING

1. GET Video tape "End Milling Operations" from cabinet "A", slot # 71 *
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN All materials to their proper places
11. CLEAN Up your work area
12. GET Your initial stamps and a ball peen hammer
13. STAMP Your initials on your workpiece
14. RETURN Your initial stamps and ball peen hammer
15. PLACE Your workpiece in your locker
16. GET LAP V. MILL # 9


#11 Woodruff Centered Within .001"
Key Seat .276" Deep ± .002"
¼" Key Slot
+.000"
−.001"
3/16"
Centered
±.001"
.625"
2⅛" +.005" −.000"
8.0"
.137"
+.002"
−.000"

LAP # 9

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 9

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Key Seating and Key Slotting

Performance Objective After completion of this LAP, you should be able to perform keyseat and key slot milling operations to specifications. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Mill keyseat with keyseat cutter and a key slot with end mill to specifications with a tolerance of + - .010

Reference
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 9	V. Mill LAPs 0 - 8	3 Hours

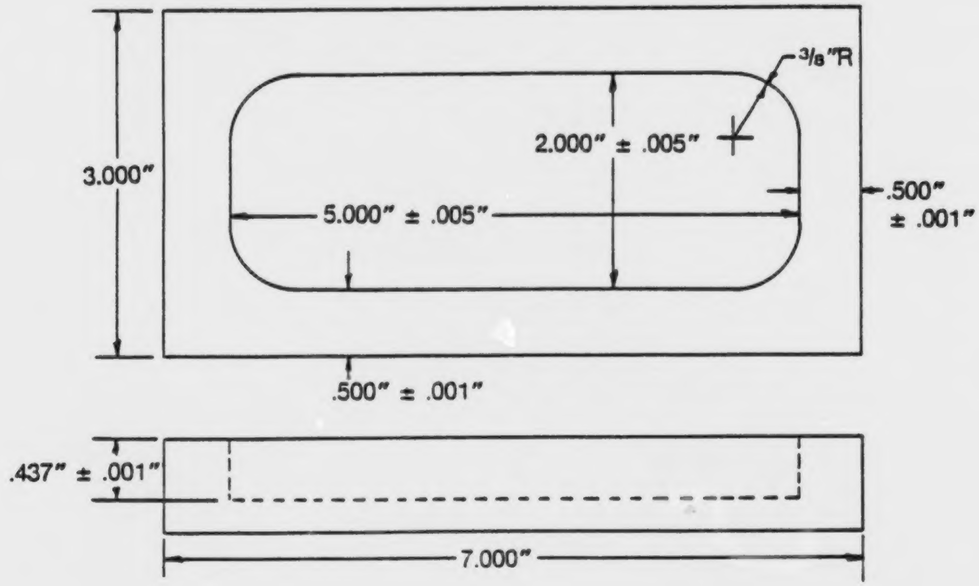
[illegible]RNING ACTIVITY PACKET GUI[illegible]
VERTICAL MILLING
LAP # 9
KEY SEATING AND KEY SLOTTING

1. GET Video tape "Mill A Key Seat" from cabinet "A", slot # 71 *
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN All materials to their proper places
11. CLEAN Up your work area
12. GET LAP V. Mill # 10

VERTICAL MILL


3/8"R
2.000" ± .005"
3.000"
5.000" ± .005"
.500" ± .001"
.500" ± .001"
.437" ± .001"
7.000"

LAP # 10

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 10

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Rectangular Slot (Pocket Milling)

Performance Objective After completion of this LAP, you should be able to mill a rectangular slot to specifications. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Mill a rectangular slot to specifications within a tolerance of + - .010

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	**Prerequisites**	**Time Range**
V. Mill - 10	V. Mill LAPs 0 - 9	3 Hours

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 10
RECTANGULAR SLOT (POCKET MILLING)

1. GET — Video tape "Mill A Rectangular Pocket" from cabinet "A", slot 71 **

2. VIEW — Video tape from footage ____ through ____

3. REWIND — Video tape and reset counter

4. RETURN — Video tape to cabinet

5. READ — Job sheet

6. ENTER — Shop using SAFETY procedures

7. GET — Materials needed

8. DO — Job sheet

9. SIGNAL — Your INSPECTOR to check your completed work

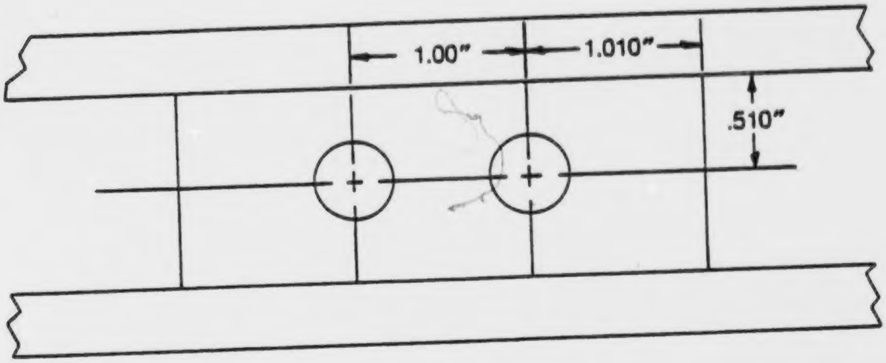
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN — All materials to their proper places

11. CLEAN — Up your work area

12. GET — LAP V. Mill # 11

VERTICAL MILL


1.00"
1.010"
.510"

LAP # 11

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM

LIBBEY SKILL CENTER, TOLEDO, OHIO

VERTICAL MILL LAP # 11

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Locating, Drilling and Reaming of Holes

Performance Objective After completion of this LAP, you should be able to locate, drill, and ream holes to specification. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Perform precision locating, drilling, and reaming of holes to specifications within a tolerance of + - .001

References 1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK

2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY

3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 11	V. Mill LAPs 0 - 10	3 Hours

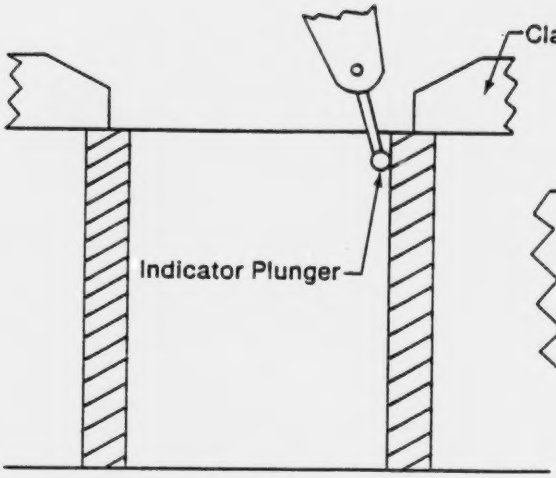
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 11
LOCATING, DRILLING, AND REAMING HOLES

1.	GET	Video tape "Precision Locating, Drilling, and Reaming" from cabinet "A", slot # 71 **
2.	VIEW	Video tape from footage ____ through ____
3.	REWIND	Video tape and reset counter
4.	RETURN	Video tape to cabinet
5.	READ	Job sheet
6.	ENTER	Shop using SAFETY procedures
7.	GET	All materials needed
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your completed work

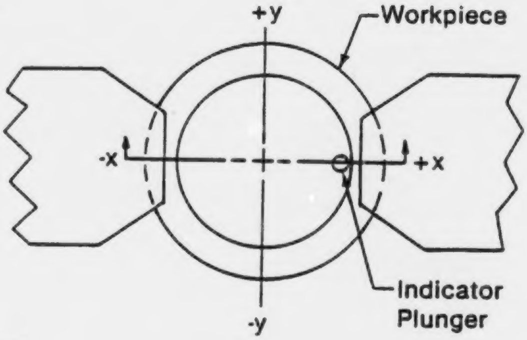
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10.	RETURN	All materials to their proper places
11.	TEAR	Down your setup
12.	CLEAN	Up your work area
13.	GET	LAP V. Mill # 12

VERTICAL MILL


Clamp
Indicator Plunger

Front View


+y
Workpiece
-x
+x
-y
Indicator Plunger

Top View

LAP # 12

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM

LIBBEY SKILL CENTER, TOLEDO, OHIO

VERTICAL MILL LAP # 12

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Align a Bore to Spindle

Performance Objective After completion of this LAP, you should be able to safely align a bore to spindle to perform specified work. This knowledge will be demonstrated through as assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Demonstrate ability to align a bore concentric to the spindle as specified

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
V. Mill - 12	V. Mill LAPs 0 - 11	3 Hours

LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 12
ALIGN A BORE TO SPINDLE

1. GET Video tape "Align and Bore" from cabinet "A", slot # 71 **

2. VIEW Video tape from footage ____ through ____

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. READ Job sheet

6. ENTER Shop using SAFETY procedures

7. GET All materials needed

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. RETURN All materials to their proper places

11. CLEAN Up your work area

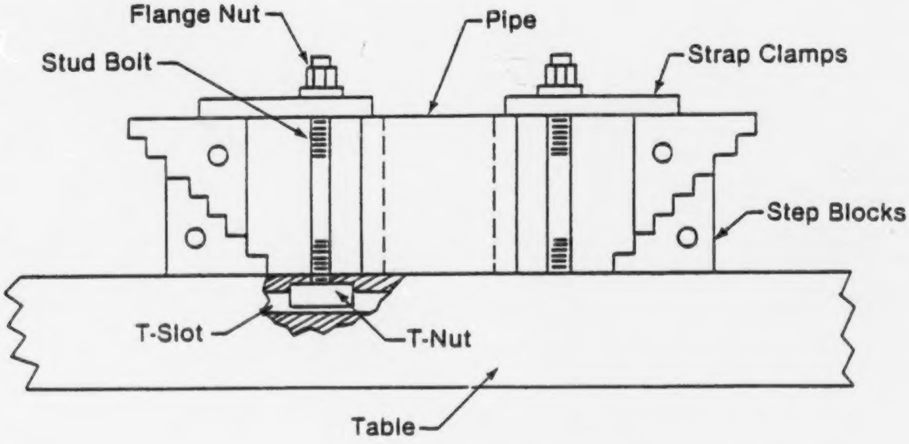
12. GET Your initial stamps and a ball peen hammer

13. STAMP Your initials on your workpiece

14. RETURN Your initial stamps and ball peen hammer

15. PLACE Your workpiece in your locker

16. GET LAP V. Mill # 13


Flange Nut
Pipe
Stud Bolt
Strap Clamps
Step Blocks
T-Slot
T-Nut
Table

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
VERTICAL MILL LAP # 13

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Vertical Milling
LAP Title	Boring

Performance Objective After completion of this LAP, you should be able to safely perform a boring operation to specification. This knowledge will be demonstrated through an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

Task

Perform a boring operation to specifications within a tolerance of + - .003

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	**Prerequisites**	**Time Range**
V. Mill - 13	V. Mill LAPs 0 - 12	3 Hours

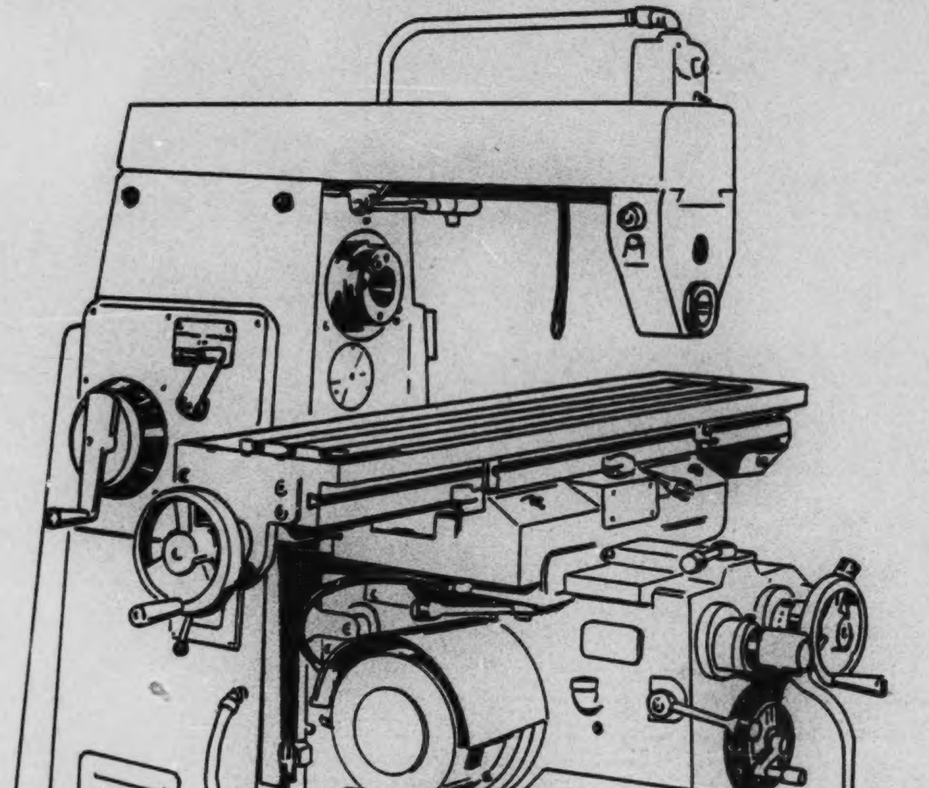
LEARNING ACTIVITY PACKET GUIDE
VERTICAL MILLING
LAP # 13
BORING

1. GET Video tape "Perform A Boring Operation" from cabinet "A", slot # 71 **
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
8. GET Materials needed
9. DO Job sheet
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All materials to their proper places
12. CLEAN Up your work area
13. PLACE Your workpiece in your locker
14. SEE Your INSTRUCTOR for next area of assignment

HORIZONTAL MILL



LAP # 0

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 0

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	SAFETY and Orientation

Performance Objective After completion of this LAP, you should be able to state safety for the horizontal milling machine. This knowledge will be demonstrated through a safety test (100% accuracy required), assignment sheets, a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate knowledge of safety procedures regarding horizontal milling

Identify horizontal milling machine controls

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY
4 - RMI, Video Tape. Safety - Horizontal Mill. Kansas City, MO.

LAP #	Prerequisites	Time Range
H. Mill # 0	Bench Metal LAPs 0 - 10 Lathe LAPs 0 - 9	1 Hours

316

LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL - 0

1. GET Video tape "Safety - Horizontal Mill" from cabinet "A", slot # 14*

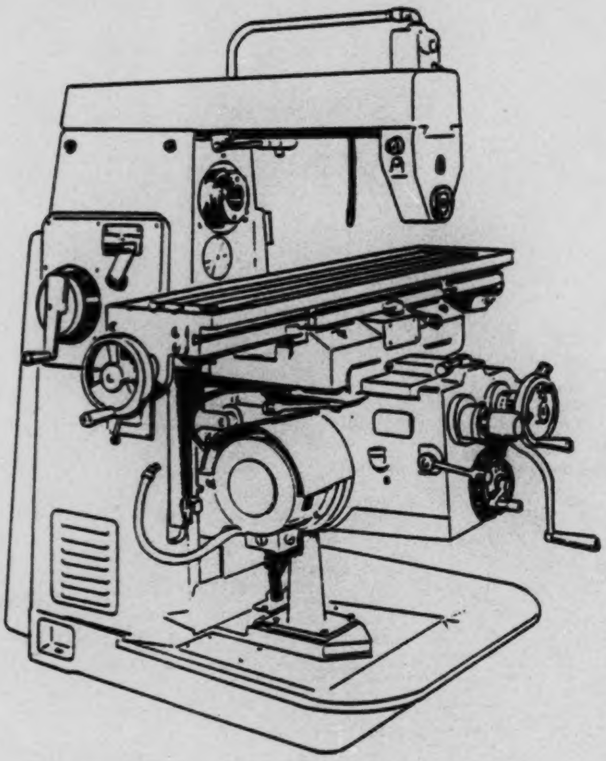
   Video tape "Use Controls Properly on A Horizontal Mill" from cabinet "A", slot # 62*

2. VIEW Video tape footage ____ through ____
3. REWIND Video tapes and reset counter
4. RETURN Video tapes to cabinet
5. TAKE SAFETY TEST
6. REVIEW Study sheet
7. COMPLETE Assignment sheets
8. READ Job sheet
9. ENTER Machine shop using SAFETY procedures
10. GIVE Your Safety Test to your INSTRUCTOR
11. GET Materials needed
12. DO Job sheet
13. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

14. CLEAN Up your work area
15. RETURN Materials to proper place
16. GET H. Mill LAP # 1

HORIZONTAL MILL



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	Arbor Mounting

Performance Objective After completion of this LAP, you should be able to mount arbor using correct procedures and to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate mounting of an arbor to specifications

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
H. Mill # 1	H. Mill LAP # 0	1 Hour

LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL LAP # 1
ARBOR MOUNTING

1. **GET** Video tape "Mount A 'Style A' and Adjust Arbor Support Bushing" from cabinet "A", slot # 62**

2. **VIEW** Video tape footage ____ through ____

3. **REWIND** Video tape and reset counter

4. **RETURN** Video tape to cabinet "A", slot # 62 **

5. **READ** Job sheet

6. **ENTER** Machine shop using SAFETY procedures

7. **GET** Materials needed

8. **DO** Job sheet

9. **SIGNAL** Your INSPECTOR to check your completed work

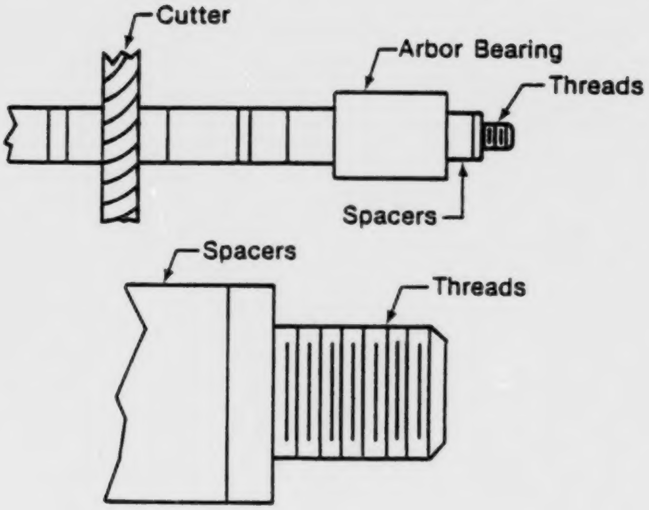
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. **CLEAN** Up your work area

11. **RETURN** Materials to proper place

12. **GET** H. Mill LAP # 2

HORIZONTAL MILL


Cutter
Arbor Bearing
Threads
Spacers
Spacers
Threads

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 2

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	Mount Cutter to Arbor

Performance Objective After completion of this LAP, you should be able to mount the cutter to the arbor as specified. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to mount cutter to arbor as specified

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
H. Mill # 2	H. Mill LAPs 0 & 1	1 Hour

LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL - 2
MOUNT CUTTER TO ARBOR

1. GET Video tape "Horizontal Mill - Mount Cutter to Arbor Base" from cabinet "A", slot # 65*

2. VIEW Video tape footage ____ through ____

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet "a". slot # 65 *

5. READ Job sheet

6. ENTER Machine shop using SAFETY procedures

7. GET Materials needed

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your completed work

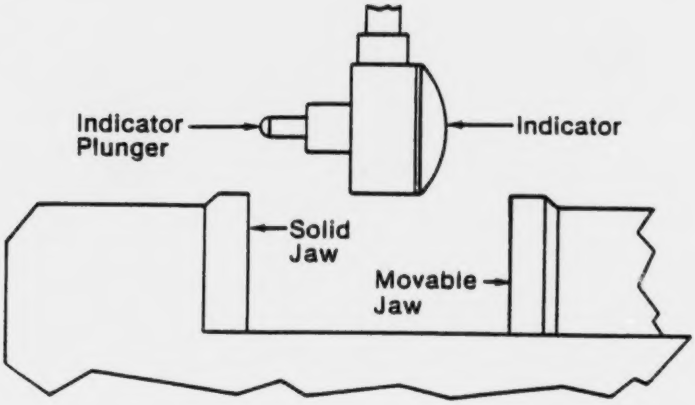
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. CLEAN Up your work area

11. RETURN Materials to proper place

12. GET H. Mill LAP # 3

HORIZONTAL MILL


Indicator Plunger
Indicator
Solid Jaw
Movable Jaw

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	Align a Vise

Performance Objective After completion of this LAP, you should be able to align a vise to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the alignment of a vise as specified

References 1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK

2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY

3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
H. Mill # 3	H. Mill LAPs 0 - 2	1 Hour

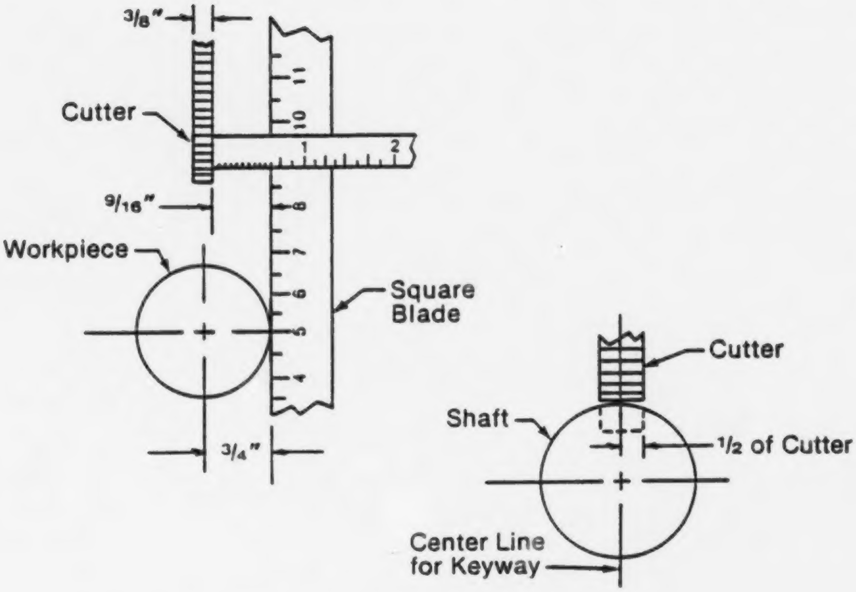
LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL - 3
ALIGN A VISE

1. GET Video tape "Horizontal Mill Mount and Align Swivel-Base Vise" from cabinet "A", slot # 14*
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "A", slot # 14 *
5. READ Job sheet
6. ENTER Machine shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. CLEAN Up your work area
11. RETURN Materials to proper place
12. GET H. Mill LAP # 4

HORIZONTAL MILL


3/8"
Cutter
11
10
1
2
9/16"
8
7
6
5
4
Workpiece
Square Blade
3/4"
Cutter
Shaft
1/2 of Cutter
Center Line for Keyway

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 5

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	Key Slot

Performance Objective After completion of this LAP, you should be able to mill a key slot to specification within a tolerance of + - .010. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate the ability to mill a key slot to specification within a tolerance of + - .010

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
H. Mill # 5	H. Mill LAPs 0 - 4	3 Hours

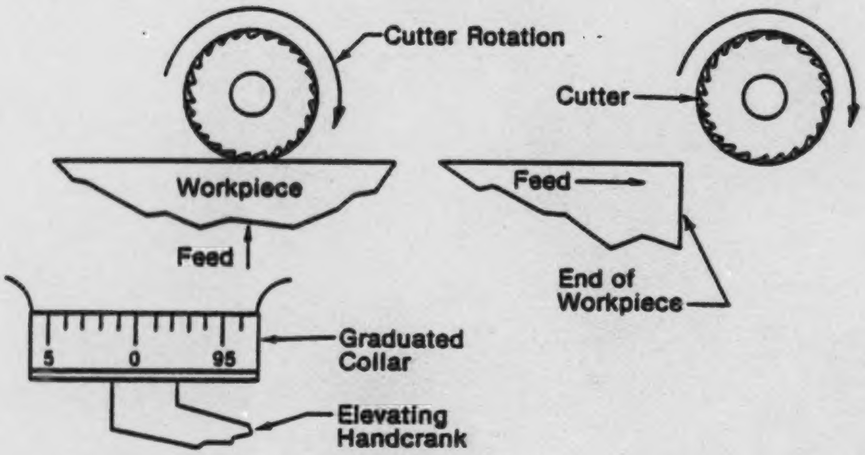
LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL - 5
MILL A KEYWAY WITH STAGGERED-TOOTH MILL CUTTER

1. GET Video tape "Mill A Keyway" from cabinet "A", slot # 68 *
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet "A", slot # 68 *
5. READ Job sheet
6. ENTER Machine shop using SAFETY procedures
7. GET Materials needed
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10. CLEAN Up your work area
11. RETURN Materials to proper place
12. GET Initial stamps and a ball peen hammer
13. STAMP Initials on workpiece
14. RETURN Initial stamps and ball peen hammer
15. PLACE Workpiece in your locker
16. SEE Your INSTRUCTOR for your assignment

HORIZONTAL MILL


Cutter Rotation
Cutter
Workpiece
Feed
Feed
End of Workpiece
5
0
95
Graduated Collar
Elevating Handcrank

LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
HORIZONTAL MILL LAP # 4

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Horizontal Mill
LAP Title	Mill A Square

Performance Objective After completion of this LAP, you should be able to mill a square to specification within a tolerance of + - .010. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Demonstrate ability to mill a square to specifications within + - .010 tolerance

References
1 - Dunn, James., Machine Shop Milling Machines, State Department of Vocational and Technical Education, 1983, Stillwater, OK
2 - Kibbe, Richard, Neely, John., Machine Tool Practices, 1982, John Wiley & Sons, New York, NY
3 - Krar, S. F., Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY

LAP #	Prerequisites	Time Range
H. Mill # 4	H. Mill LAPs 0 - 3	3 Hours

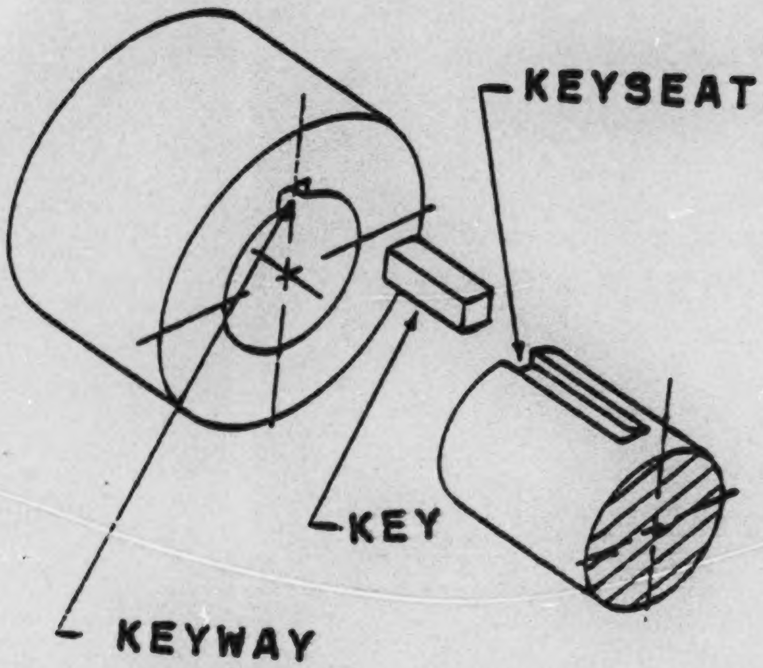
LEARNING ACTIVITY PACKET GUIDE
HORIZONTAL MILLING
H. MILL - 4
MILL A SQUARE

1.	GET	Video tape "Mill Square A Workpiece Mounted in A Vise" from cabinet "A", slot # 14 *
2.	VIEW	Video tape
3.	REWIND	Video tape and reset counter
4.	RETURN	Video tape to cabinet "A", slot # 14 *
5.	READ	Job sheet
6.	ENTER	Machine shop using SAFETY procedures
7.	GET	Materials needed
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10.	TEAR	Down setup
11.	CLEAN	Your work area
12.	RETURN	Materials to proper place
13.	GET	Initial stamps and a ball peen hammer
14.	STAMP	Initials on workpiece
15.	RETURN	Initial stamps and ball peen hammer
16.	PLACE	Workpiece in your locker
17.	GET	H. Mill LAP # 5

BROACHING


KEYSEAT
KEY
KEYWAY

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
BROACHING LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Broaching
LAP Title	Keyway Broaching

Performance Objective After completion of this LAP, you should be able to state safety and operational procedures for hand broaching of an internal keyway. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform hand broaching operations to cut an internal keyway

Reference 1 - Kibbe, Richard. Neely, John. Machine Tool Practices. 1982. John Wiley & Sons. New York, NY.

LAP #	Prerequisites	Time Range
BR # 1		3 Hours

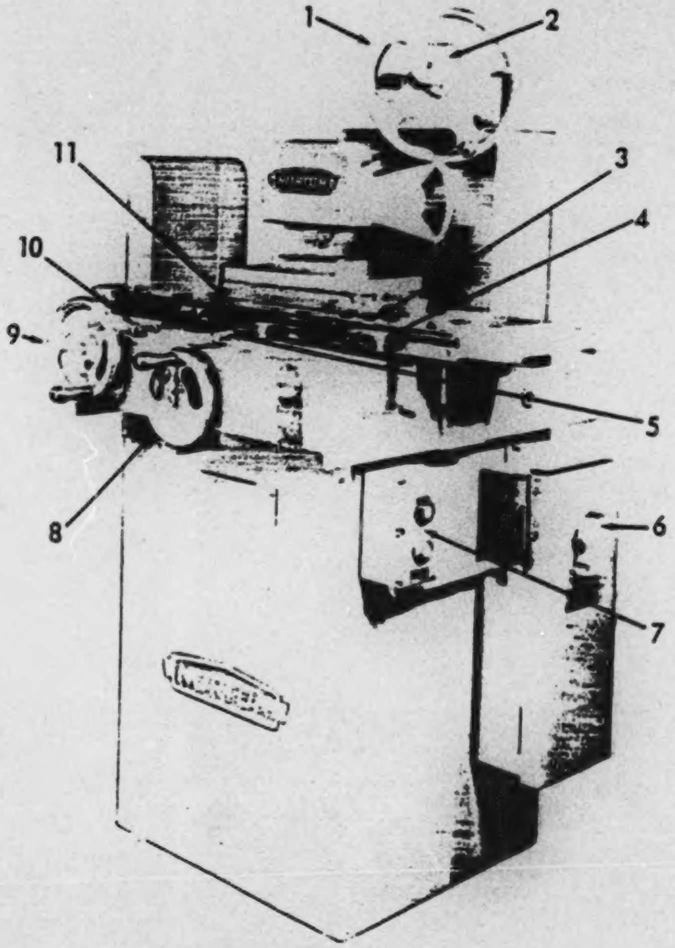
LEARNING ACTIVITY PACKET GUIDE
BROACHING
LAP # 1
KEYWAY BROACHING

1.	REVIEW	Study sheet
2.	READ	Job sheet
4.	ENTER	Shop using SAFETY procedures
5.	GET	Materials needed
5.	DO	Job sheet
6.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7.	RETURN	Materials to their proper place
8.	CLEAN	Up your work area
9.	SEE	Your INSTRUCTOR for your next assignment

SURFACE GRINDING


1
2
11
3
10
4
9
5
8
6
7

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SURFACE GRINDING # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Machine Shop
Instructional Unit	Surface Grinding
LAP Title	Surface Grinding

Performance Objective After completion of this LAP, you should be able to safely state safety and operational procedures and surface grind a workpiece square and parallel. This knowledge will be demonstrated through an assignment sheet, a safety test (100% required), a job sheet, and a unit test with a minimum of 85% accuracy.

Tasks

State SAFETY procedures related to surface grinding

Surface grind a workpiece square and parallel

References
1 - Dunn, James. Machine Shop Lathes, Oklahoma State Board of Vocational and Technical Education, 1983. Stillwater, OK.
2 - Kibbe, Richard, Neely, John. Machine Tool Practice. 1982. John Wiley & Sons. New York, NY.
3 - Krar, S. F. & Oswald, J. W., Amand, J. E., Machine Shop Operations, 1975, McGraw-Hill Ryerson Limited, New York, NY.

LAP #	Prerequisites	Time Range
S. G. # 1	H. Mill LAPs 0 - 5	3 Hours

LEARNING ACTIVITY PACKET GUIDE
SURFACE GRINDING
LAP # 1

1.	REVIEW	Study sheets
2.	COMPLETE	Assignment sheet
3.	TAKE	Safety test
4.	GIVE	Your answers to the Safety Test to your INSTRUCTOR
5.	READ	Job sheet
6.	ENTER	Shop using SAFETY procedures
7.	GET	Materials needed
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

10.	CLEAN	Up your work area
11.	RETURN	All materials to their proper place
12.	SEE	Your INSTRUCTOR for your next assignment

FABRICATION LEARNING ACTIVITY PACKETS

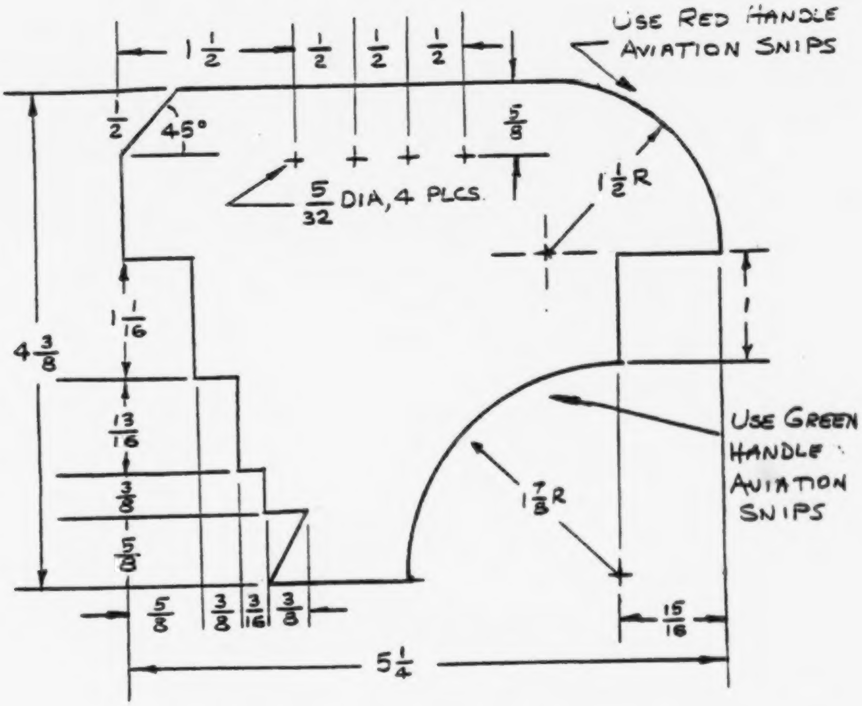
METAL FABRICATION

SHEET METAL

WELDING

WELDING
OXY-ACETYLENE

SHEET METAL


1 1/2
1/2
1/2
1/2
USE RED HANDLE AVIATION SNIPS
1/2
45°
5/8
5/32 DIA, 4 PLCS.
1 1/2 R
4 3/8
1 1/16
1
13/16
3/8
5/8
USE GREEN HANDLE AVIATION SNIPS
1 7/8 R
5/8
3/8
3/16
3/8
15/16
5 1/4

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 1

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Layout, Hand Shearing, & Punching

Performance Objective After completion of this LAP, you should be able to safely perform sheet metal layouts, hand shearing, and hand punching to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Perform layout, hand shearing, and hand punching on flat sheet stock

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA

2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, Delmar Publishers, 1974, Albany, NY

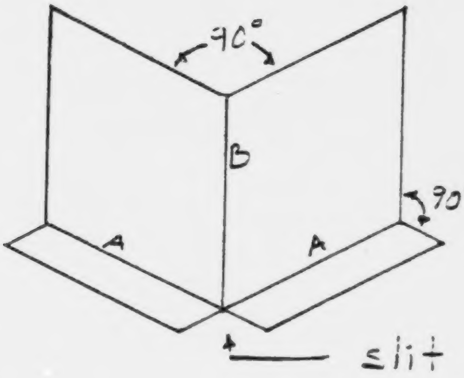
LAP #	Prerequisites	Time Range
Sh-Metal # 1	Orientation LAP	3 Hours

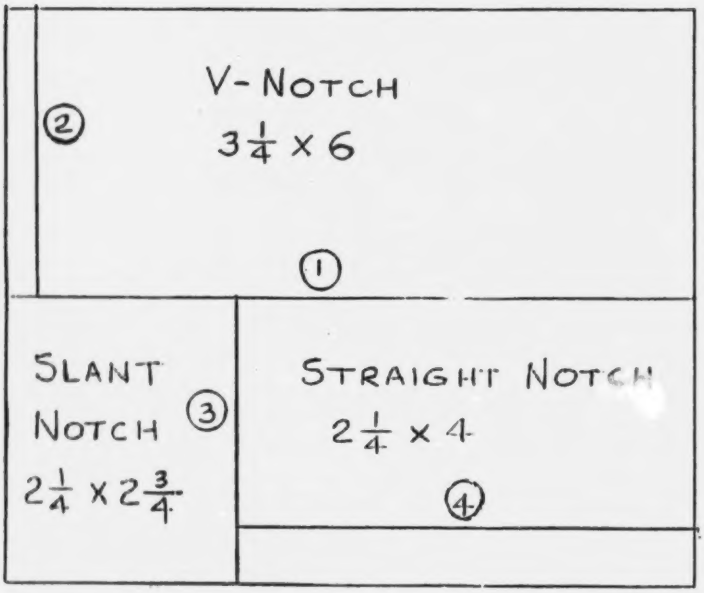
LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 1

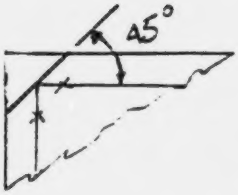
1. REVIEW Study sheet
2. READ "Job Sheet" Identify tools, materials needed, and procedures
3. ENTER Shop using SAFETY procedures
4. GET Materials and tools as listed on your Job Sheet
5. GO To large table in the METAL FABRICATION AREA of the shop
6. DO Job Sheet # 1
7. SIGNAL Your INSPECTOR to check your completed work

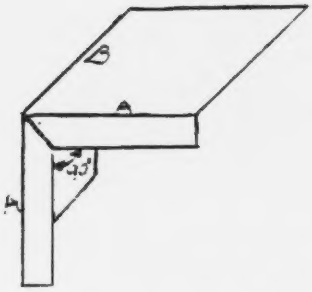
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

8. RETURN All tools to their proper place in the tool room
9. CLEAN Up your work area
10. GET Sheet Metal LAP # 2


90°
B
90°
A
A
slit


V-Notch
3 1/4 x 6
②
①
Slant
Notch
2 1/4 x 2 3/4
③
Straight Notch
2 1/4 x 4
④


45°
x
x


B
A
45°
A

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP #2

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Notching

Performance Objective After completion of this LAP, you should be able to safely perform sheet metal operations for straight, V, and slant notching. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Demonstrate proper technique for straight, V, and slant notching

Reference 1 - Bruce, Leroy F., Meyer, Leo A., Sheet Metal Shop Practice, American Technical Society, 1972, Chicago, IL

2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Machine Processes, Delmar Publishers, 1975, Albany, NY

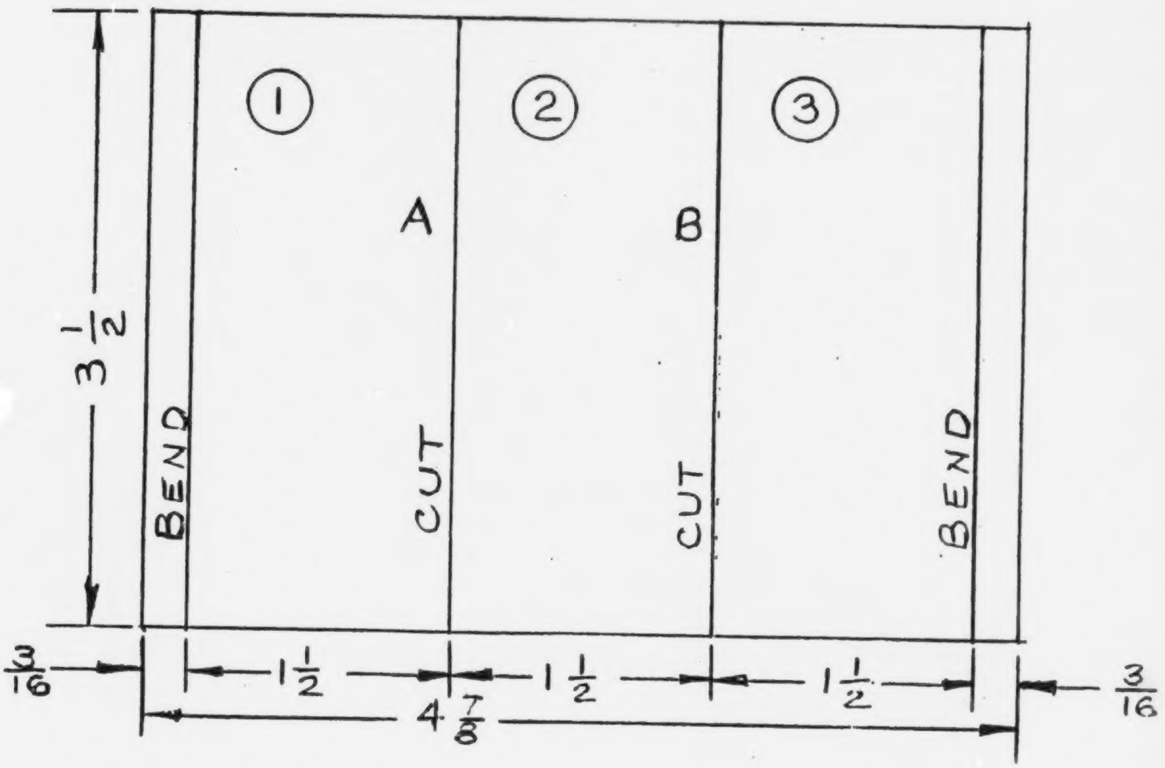
LAP #	Prerequisites	Time Range
Sh-Metal # 2	Sh-Metal LAP # 1	3 Hours

LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 2
NOTCHING

1.	REVIEW	Study sheet
2.	READ	"Job Sheet" Identify tools, materials needed and procedures
3.	ENTER	Shop using SAFETY procedures
4.	GET	Materials and tools as listed on your Job Sheet
5.	GO	To the large table in the METAL FABRICATION AREA of the shop
6.	DO	Job sheet #2
7.	SIGNAL	Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

8.	RETURN	All tools to their proper place in the tool room
9.	GET & DO	The initial stamp and a ball peen hammer and place your initials on the back side of your work and return stamps to tool room
10.	CLEAN	Up your work area
11.	GET	Sheet Metal LAP # 3


①
②
③
A
B
BEND
CUT
CUT
BEND
3 1/2
3/16
1 1/2
1 1/2
1 1/2
3/16
4 7/8

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 3

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Joining Exercise

Performance Objective After completion of this LAP, you should be able to safely perform sheet metal joining operations with hems, spot weld, and pop riveting. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Tasks

Perform layout and cutting to specifications

Perform outside seam, inside seam, and groove seam to specifications

Perform spot weld and pop rivet to specifications

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA
2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 3	Sh. Metal LAPs 1 & 2	3 Hours

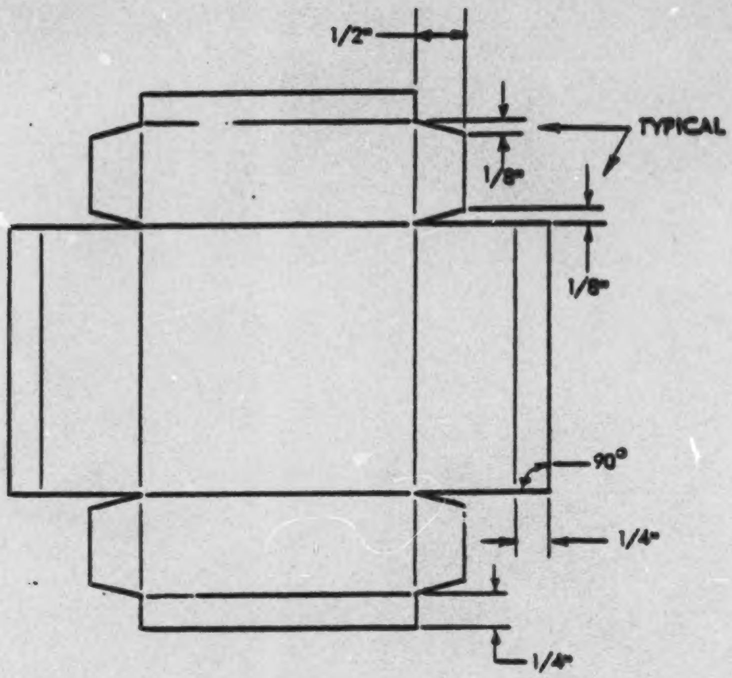
LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 3
JOINING

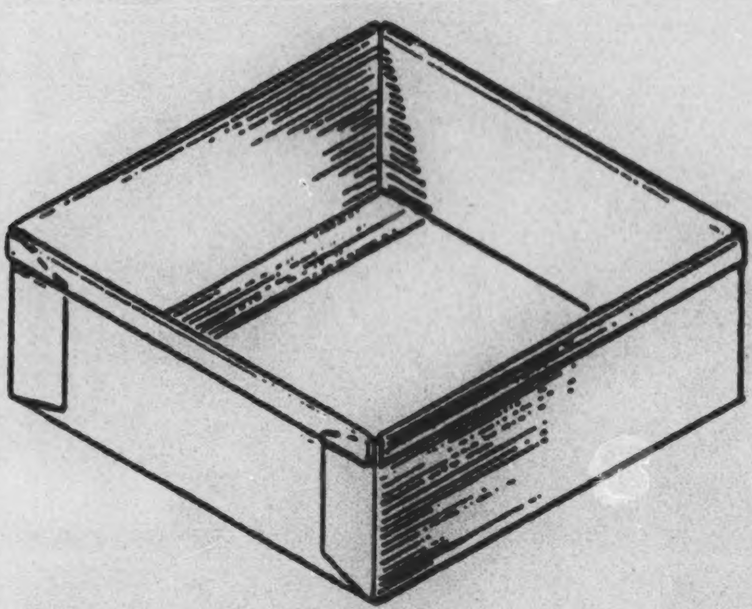
1. GET Video tape "Sheet Metal Joining" from cabinet # ____, slot # ____,
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. READ Job sheet
6. ENTER Shop using SAFETY procedures
7. GET Materials and tools as listed on your Job Sheet
8. GO To large table in the METAL FABRICATION AREA of the shop
9. DO Job Sheet # 3
10. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

11. RETURN All tools to their proper place in the tool room
12. CLEAN Up your work area
13. GET Your initial stamp and a ball peen hammer
14. PLACE Your initials on the back side of piece
15. RETURN Your initial stamp and ball peen hammer
16. GET Sheet Metal LAP # 4

SHEET METAL


1/2"
TYPICAL
1/8"
1/8"
90°
1/4"
1/4"



LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 4

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Construct a Rectangular Box

Performance Objective After completion of this LAP, you should be able to safely construct a sheet metal rectangular box to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Construct sheet metal rectangular box

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA

2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 4	Sh-Metal LAPs 1 - 3	3 Hours

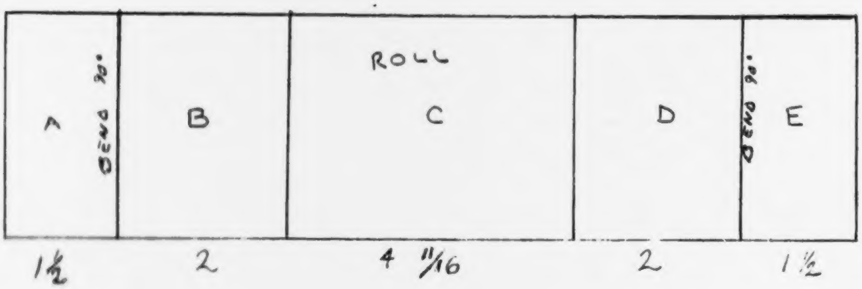
LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 4
CONSTRUCT RECTANGULAR BOX

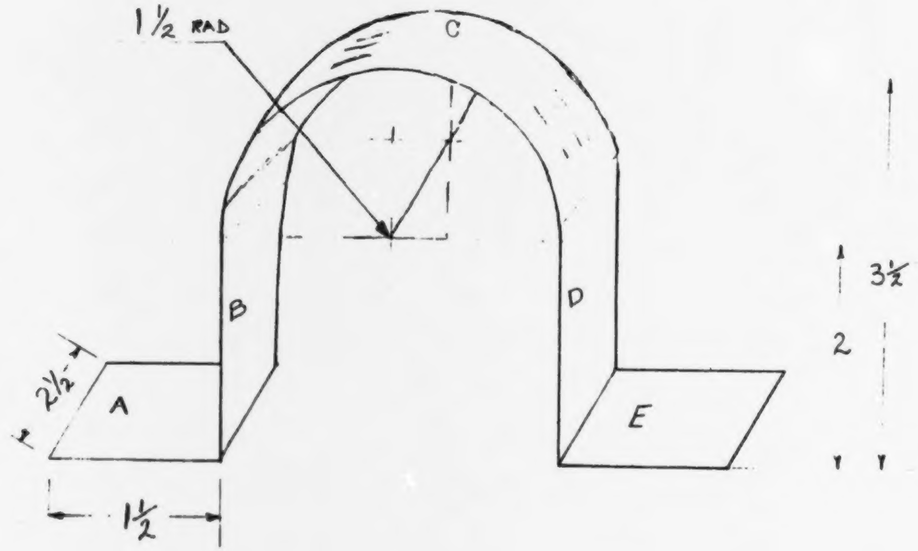
1. GET Video tape "Sheet Metal Rectangular Box Construction" from cabinet # ____, slot # ____
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. REVIEW Study Sheets
6. READ Job Sheet
7. ENTER Shop using SAFETY procedures
8. GET Materials and tools as listed on your Job Sheet
9. GO To large table in the METAL FABRICATION AREA of the shop
10. DO Job Sheet #4
11. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN All tools to their proper place in the tool room
13. CLEAN Up your work area
14. GET Your initial stamp and a ball peen hammer
15. PLACE Your initials on the under side of your box
16. RETURN Your initial stamp and ball peen hammer
17. GET Sheet Metal LAP # 5

SHEET METAL


ROLL
A
BEND 90°
B
C
D
BEND 90°
E
1½
2
4 11/16
2
1½


1½ RAD
C
B
D
A
E
2½
1½
3½
2

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 5

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Coupling Guard

Performance Objective After completion of this LAP, you should be able to safely construct a coupling guard to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Construct a coupling guard to specifications

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA

2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 5	Sh-Metal LAPs 1 - 4	2 Hours

LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 5
CONSTRUCT COUPLING GUARD

1. GET Video tape "Sheet Metal Coupling Guard" located in cabinet # ____, slot # ____

2. VIEW Video tape footage ____ through ____

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. REVIEW Study sheet

6. READ Job sheet

7. ENTER Shop using SAFETY procedures

8. GET Materials and tools as listed on your Job sheet

9. GO To large table in the METAL FABRICATION AREA of the shop

10. DO Job sheet # 5

11. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

12. RETURN All tools to their proper place in the tool room

13. CLEAN Up your work area

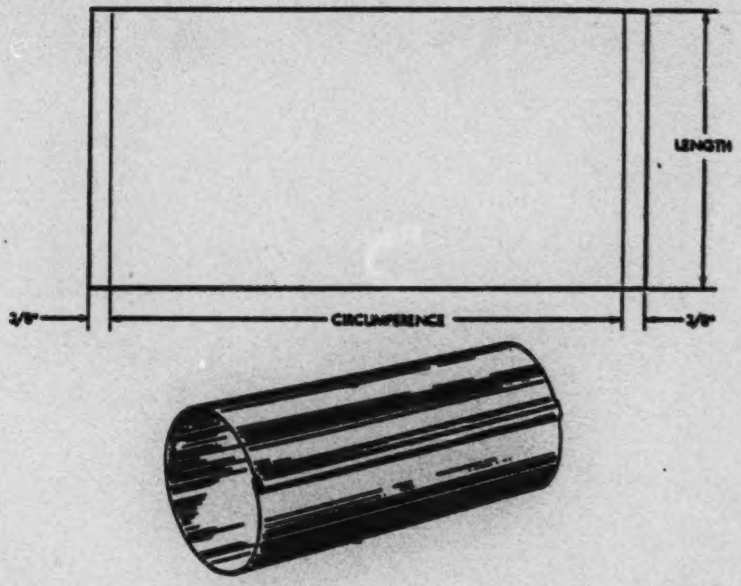
14. GET Your initial stamp and a ball peen hammer

15. PLACE Your initials on the under side of your guard

16. RETURN Your initial stamp and ball peen hammer

17. GET Sheet Metal LAP # 6

SHEET METAL


LENGTH
3/8"
CIRCUMFERENCE
3/8"

LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 6

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Cylinder with 1/4" Groove Seam

Performance Objective After completion of this LAP, you should be able to safely construct a cylinder with 1/4" groove seam from flat sheet metal to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Construct a round pipe with 1/4" groove seam from flat sheet metal to specifications

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA

2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 6	Sh-Metal LAPs 0 - 5	3 Hours

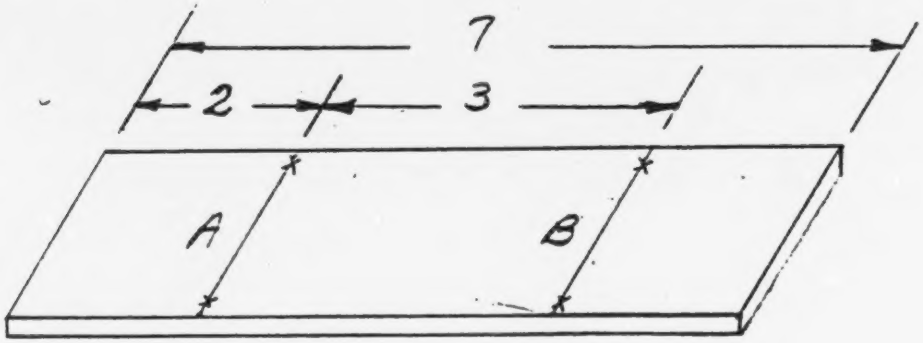
LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 6
CONSTRUCT A CYLINDER

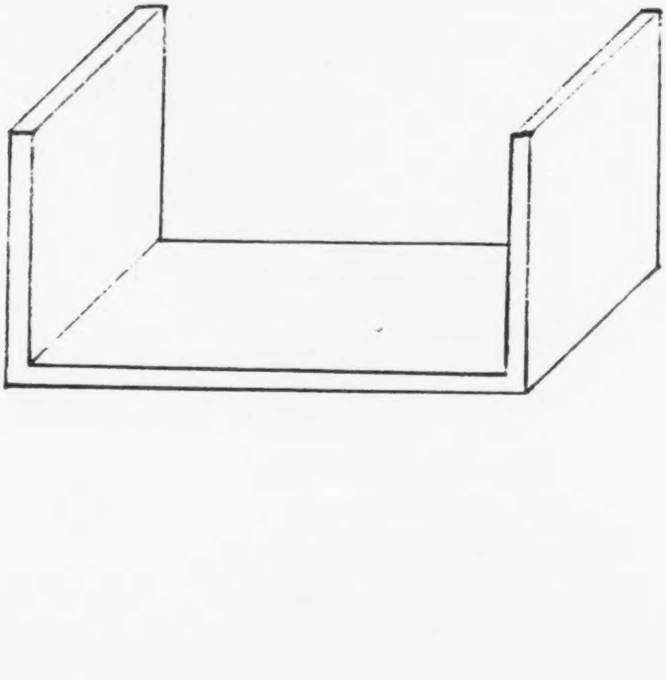
1. GET Video tape "Sheet Metal Cylinder Construction" located in cabinet # ____, slot # ____
2. VIEW Video tape footage ____ through ____
3. REWIND Video tape and reset counter
4. RETURN Video tape to cabinet
5. REVIEW Study sheet
6. READ Job sheet
7. ENTER Shop using SAFETY procedures
8. GET Materials and tools as listed on your Job sheet
9. GO To large table in the METAL FABRICATION AREA of the shop
10. DO Job sheet # 6
11. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN All tools to their proper place in the tool room
13. CLEAN Up your work area
14. GET Your initial stamp and a ball peen hammer
15. PLACE Your initials on your cylinder
16. RETURN Your initial stamp and ball peen hammer
17. GET Sheet Metal LAP # 7

SHEET METAL





LAP # 7

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 7

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Bending Flat Stock

Performance Objective After completion of this LAP, you should be able to safely bend flat stock to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Perform bending of flat stock to specifications

Reference 1 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA
2 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 7	Sh-Metal LAPs 1 - 6	2 Hours

LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP #7

1. READ Job Sheet

2. ENTER Shop using SAFETY procedures

3. GET Materials and tools as listed on your Job sheet

4. GO To large table in the METAL FABRICATION AREA of the shop

5. DO Job sheet

6. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

7. RETURN All tools to their proper place in the tool room

8. CLEAN Up your work area

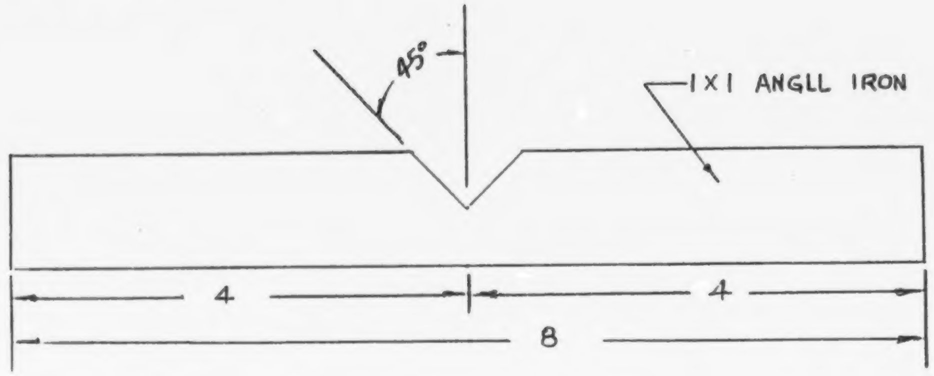
10. GET Your initial stamp and a ball peen hammer

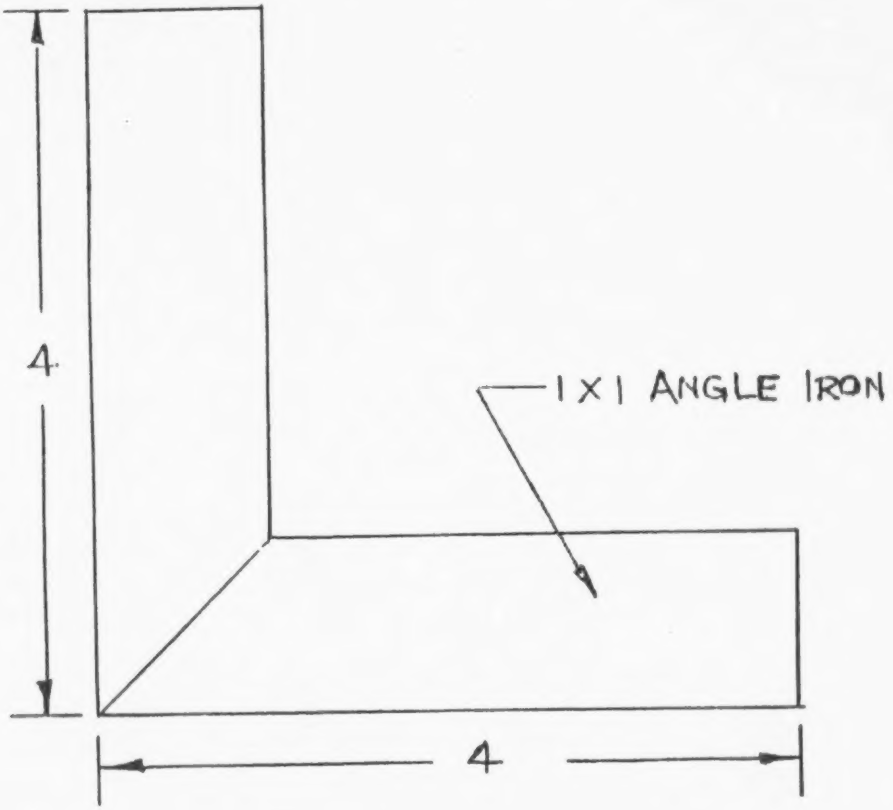
11. STAMP Your initials on your cylinder

12. RETURN Your initial stamp and ball peen hammer

13. GET Sheet Metal LAP # 7

SHEET METAL


45°
1X1 ANGLL IRON
4
4
8


4
1X1 ANGLE IRON
4

LAP # 8

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 8

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	90 Degree Angle Iron W/Mitred Corner

Performance Objective After completion of this LAP, you should be able to safely construct a 90 degree angle iron with a mitred corner. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Construct 90 degree angle iron with a mitred corner

Reference
1 - Hossfeld Universal Bender. Operating Instructions. Hossfeld Manufacturing Co. Winona, MN. 1966
2 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA
3 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 8	Sh-Metal LAPs 1 - 7	2 Hours

LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 8
CONSTRUCT 90 DEGREE ANGLE IRON WITH MITRED CORNER

1. GET Video tape "Sheet Metal Angle Iron Bender" located in cabinet # ____, slot # ____

2. VIEW Video tape

3. REWIND Video tape and reset counter

4. RETURN Video tape to cabinet

5. REVIEW Study sheets

6. READ Job sheet

7. ENTER Shop using SAFETY procedures

8. GET Materials and tools as listed on your Job sheet

9. GO To large table in the METAL FABRICATION AREA of the shop

10. DO Job sheet # 8

11. SIGNAL Your INSPECTOR to check your completed work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN All tools to their proper place in the tool room

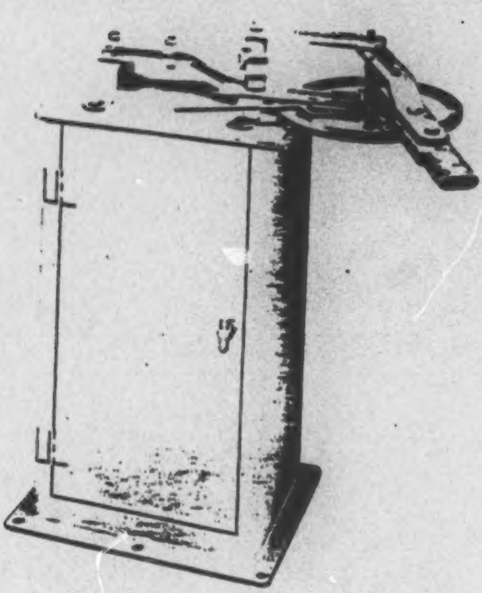
13. CLEAN Up your work area

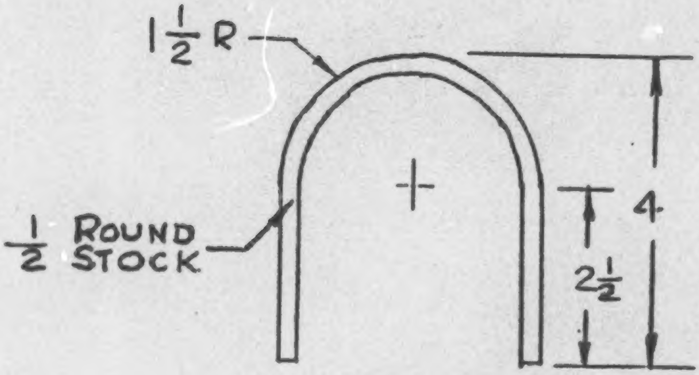
14. GET Your initial stamp and a ball peen hammer

15. STAMP Your initials on your angle iron/mitred corner

16. RETURN Your initial stamp and ball peen hammer

17. GET Sheet Metal LAP # 9




1½ R
½ ROUND STOCK
4
2½

LAP # 9

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
SHEET METAL LAP # 9

LEARNING ACTIVITY PACKET

Major Instructional Area	Metal Fabrication
Instructional Unit	Sheet Metal
LAP Title	Bending a U-Bolt

Performance Objective After completion of this LAP, you should be able to safely construct a U-bolt from 3/8" round stock to specifications. This knowledge will be demonstrated through a job sheet and a unit test with a minimum of 85% accuracy.

Task

Form a U-bolt from 3/8" round stock to specifications

Reference 1 - Hossfeld Universal Bender. Operating Instructions. Hossfeld Manufacturing Co. Winona, MN. 1966
2 - Wireman, Terry., Industrial Maintenance, Reston Publishing Co., 1983, Reston, VA
3 - Zinngrabe, Claude J., Schumacher, Fred W., Sheet Metal Hand Processes, 1974, Delmar Publishers

LAP #	Prerequisites	Time Range
Sh-Metal # 9	Sh-Metal LAPs 1 - 8	2 Hours

LEARNING ACTIVITY PACKET GUIDE
SHEET METAL
LAP # 9
U-BOLT

1. GET Video tape "Sheet Metal Forming A U-Bolt" located in cabinet # ____, slot # ____
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. RETURN Video to cabinet
5. REVIEW Study sheet
6. READ Job sheet
7. ENTER Shop using SAFETY procedures
8. GET Materials and tools as listed on your job sheet
9. GO To the Hossfeld bender
10. DO Job sheet # 9
11. SIGNAL Your INSPECTOR to check your completed work

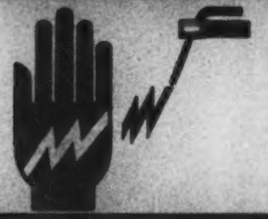
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE ON WITH THIS LAP

12. RETURN All tools to their proper place in the tool room
13. CLEAN Up your work area
14. GET Your initial stamp and a ball peen hammer
15. STAMP Your initials on your U-bolt
16. RETURN Your initial stamp and ball peen hammer
17. ASK Your INSTRUCTOR for your next area of assignment

METAL FABRICATION

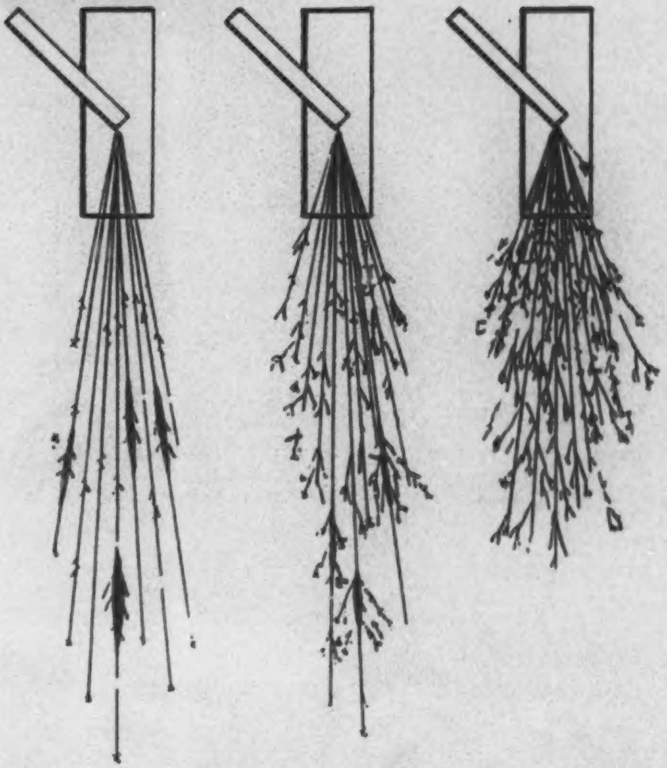
WELDING

⚠ WARNING



ELECTRIC SHOCK
can kill.

- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground.**



LAP # O

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING
LAP TITLE	INTRODUCTION AND SAFETY

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to pass a welding safety test with 100% accuracy and perform metal identification. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Pass Safety Test with 1005 accuracy

Perform metal identification spark test

REFERENCE Hendrix, Laborn J. Millwright Instructional Materials. Oklahoma State Board of Vocational and Technical Education. Stillwater, OK. 1980.

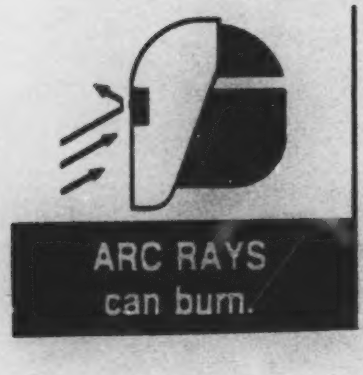
LAP #	Prerequisites	Time Range
Welding # 0	None	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING LAP # 0
INTRODUCTION AND SAFETY

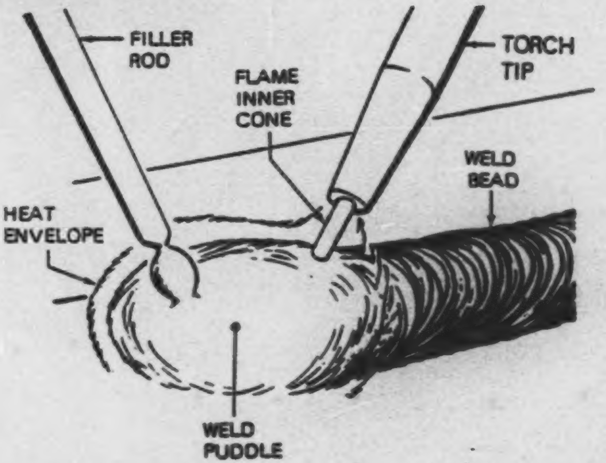
1. GET Video tape
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. REVIEW Study sheet
5. DO Assignment sheet (review tape if needed to complete)
6. CHECK Your answers to make sure they are correct
7. RETURN Video tape to cabinet
8. TAKE Safety Test
9. SIGNAL Your INSTRUCTOR to check your test

YOUR INSTRUCTOR WILL ASSIGN YOU TO OXY-ACETYLENE OR SHIELD METAL ARC

WELDING
OXY-ACETYLENE


ARC RAYS
can burn.

- **Wear eye, ear and body protection.**


FILLER ROD
TORCH TIP
FLAME INNER CONE
WELD BEAD
HEAT ENVELOPE
WELD PUDDLE

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	SAFETY AND SETUP

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to pass a safety test with 100% accuracy and set-up procedures for Oxy-acetylene Welding. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Pass Safety test with 100% accuracy and set-up for oxy-acetylene

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 0	WELD-0	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – OXY-ACETYLENE LAP # 0
SAFETY AND SETUP

1. GET Video tape "Oxyacetylene Welding, cutting and Brazing" from cabinet "A", slot # 32 *

2. VIEW "Intro to Oxyacetylene Applications" and "Safety and Health in Oxyacetylene Applications"

3. DO Assignment sheet

4. CHECK Your answers to make sure they are correct

5. TAKE Test

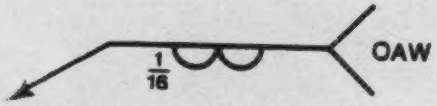
6 SIGNAL Your INSTRUCTOR to check your work

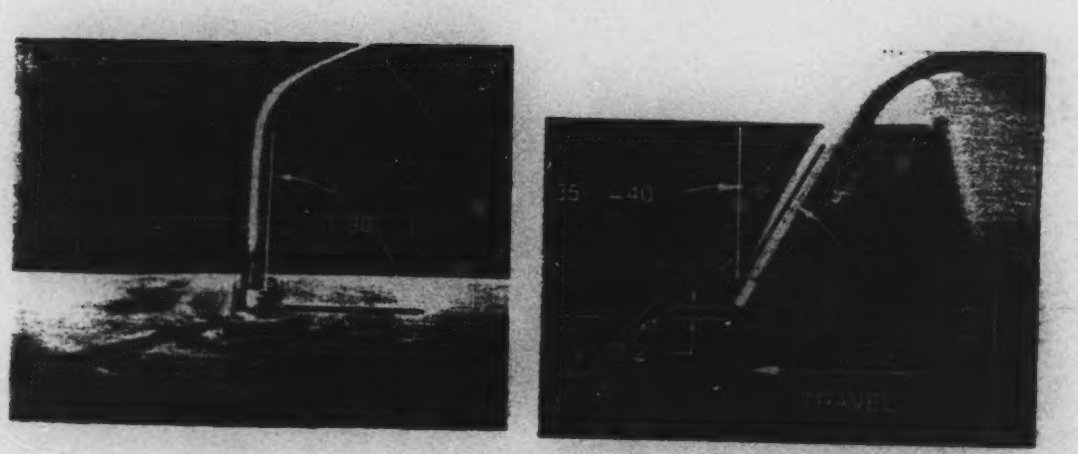
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

7. RETURN W-OXY # 0 to the cabinet

8. GET W-OXY # 1 from the cabinet and continue

WELDING
OXY-ACETYLENE




30
35 - 40
TRAVEL

LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	STRINGER BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce stringer beads in flat position with and without the use of filler metal. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce stringer beads in flat position with and without the use of a filler metal

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 1	WELD-0, W-OXY LAP # 0	3 Hours

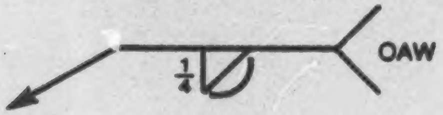
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – OXY-ACETYLENE LAP # 1
STRINGER BEADS

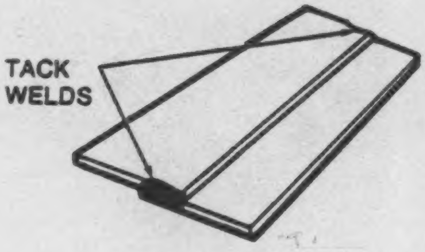
1. GET Video tape "Stringer Bead" from cabinet "A", slot # 32 *
2. VIEW Video tape from footage ____ through ____
3. REWIND Video tape and reset counter
4. COMPLETE Assignment sheet
5. CHECK Your work
6. RETURN Video tape to cabinet "A", slot # 32 *
7. READ Job sheet
8. ENTER Shop using SAFETY procedures
9. GET Equipment and materials needed
10. PRACTICE Skill needed to do Job sheet
11. DO Job sheet
12. SIGNAL Your INSPECTOR to check your work

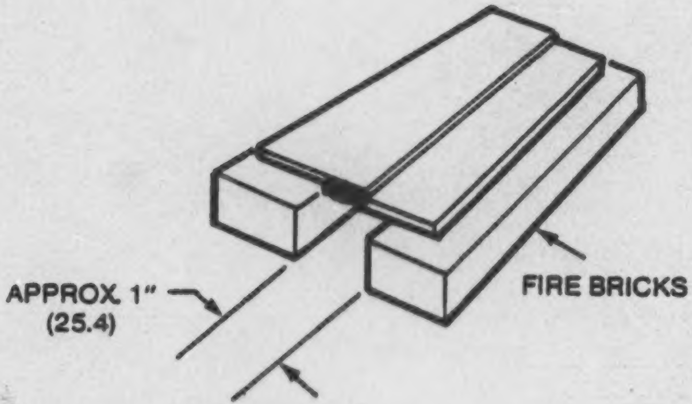
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

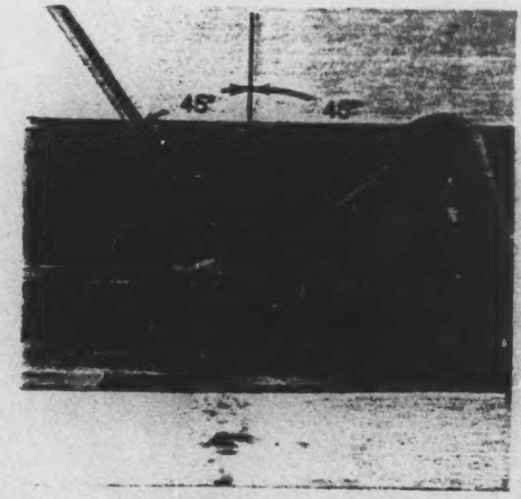
13. RETURN All equipment and materials to their proper places
14. GET Initial stamps and a ball peen hammer
15. STAMP Your initials on the backside of your workpiece
16. PLACE Your workpiece in your locker
17. RETURN Initial stamps and ball peen hammer to tool room
18. CLEAN Your work area
19. RETURN W-OXY LAP # 1 to the cabinet
20. GET W-OXY LAP # 2 and continue

WELDING
OXY-ACETYLENE






APPROX. 1"
(25.4)
FIRE BRICKS



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	LAP JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality lap joint fillet welds in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality lap joint fillet welds in flat position

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 2	WELD-0, W-OXY #s 0-1	3 Hours

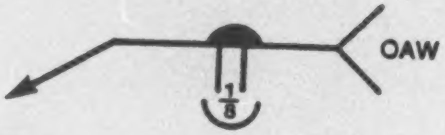
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – OXY-ACETYLENE LAP # 2
LAP JOINT

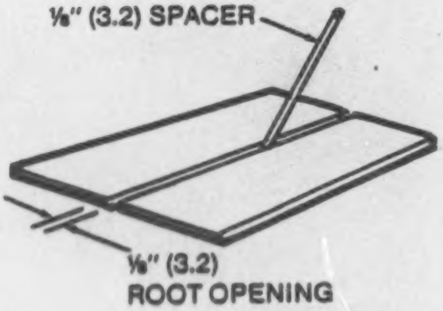
1. REVIEW Study sheet
2. DO Assignment sheet
3. CHECK Your answers to make sure they are correct
4. READ Job sheet
5. ENTER Shop using SAFETY procedures
6. GET Equipment and materials needed
7. PRACTICE Skill process for Job sheet
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

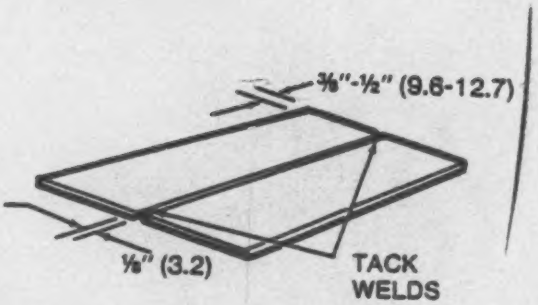
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

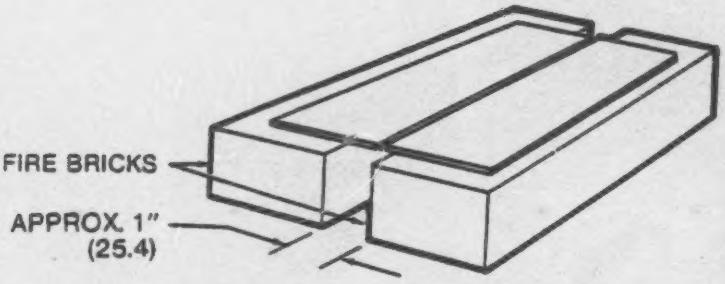
10. RETURN Equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. RETURN Initial stamps and ball peen hammer to the tool room
14. PLACE Your workpiece in your locker
15. CLEAN Your work area
16. RETURN W-OXY # 2 to the cabinet
17. GET W-OXY # 3 from the cabinet and continue

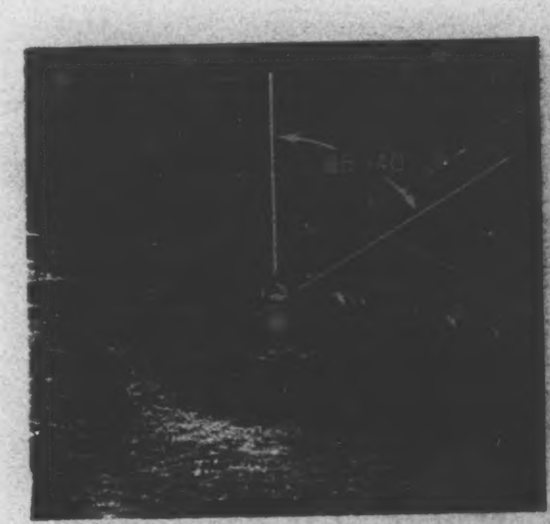
WELDING
OXY-ACETYLENE




⅛" (3.2) SPACER
⅛" (3.2)
ROOT OPENING


⅜"-½" (9.6-12.7)
⅛" (3.2)
TACK
WELDS


FIRE BRICKS
APPROX. 1"
(25.4)



INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	BUTT JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality square groove weld on a butt joint in the flat position using the keyhole technique. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality square groove weld on a butt joint in the flat position using the keyhole technique

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 3	WELD-0, W-OXY #s 0-2	3 Hours

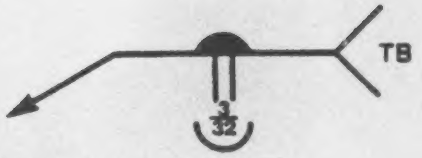
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - OXY-ACETYLENE LAP # 3
BUTT JOINT

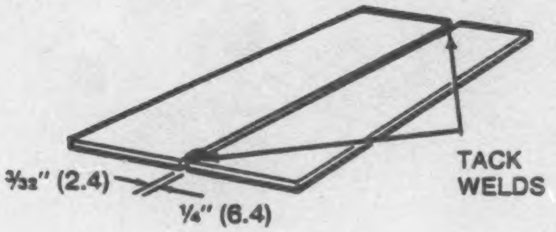
1. REVIEW Study sheet
2. DO Assignment sheet
3. CHECK Your answers to make sure they are correct
4. READ Job sheet
5. ENTER Shop using SAFETY procedures
6. GET Equipment and materials needed
7. PRACTICE Skill for Job sheet
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

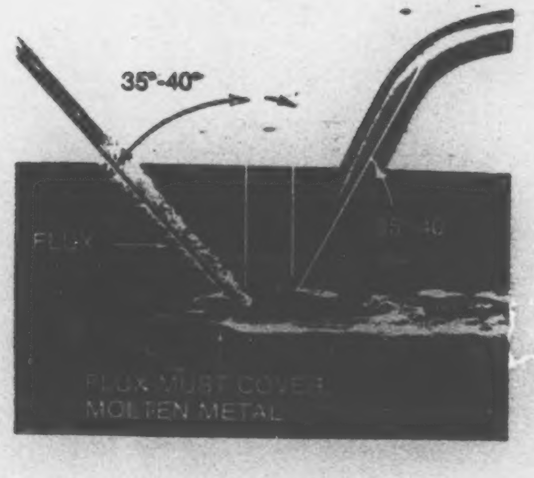
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. RETURN Initial stamps and ball peen hammer
14. PLACE Your workpiece in your locker
15. CLEAN Your work area
16. RETURN W-OXY # 3 to the cabinet
17. GET W-OXY # 4 from the cabinet and continue

WELDING
OXY-ACETYLENE




3/32" (2.4)
1/4" (6.4)
TACK
WELDS


35°-40°
FLUX
35°-40°
FLUX MUST COVER
MOLTEN METAL

LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	BRAZED BUTT JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce a quality brazed butt joint. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce a quality brazed butt joint

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 4	WELD-0, W-OXY #s 0-3	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – OXY-ACETYLENE LAP # 4
BRAZED BUTT JOINT

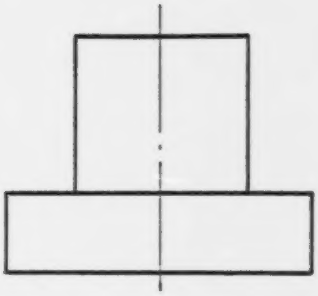
1.	REVIEW	Study sheet
2.	DO	Assignment sheet
3.	CHECK	Your answers to make sure they are correct
4.	READ	Job sheet
5.	ENTER	Shop using SAFETY procedures
6.	GET	Equipment and materials needed
7.	PRACTICE	Skill for Job sheet
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your work

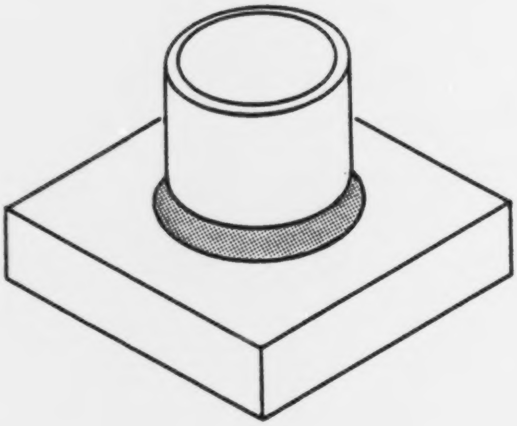
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10.	RETURN	All equipment and materials to their proper places
11.	GET	Initial stamps and a ball peen hammer
12.	STAMP	Your initials on the backside of your workpiece
13.	RETURN	Initial stamps and ball peen hammer
14.	PLACE	Your workpiece in your locker
15.	CLEAN	Your work area
16.	RETURN	W-OXY # 4 to the cabinet
17.	GET	W-OXY # 5 from the cabinet and continue

METAL FABRICATION

WELDING
OXY-ACETYLENE





LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	BRAZED PIPE JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce a quality brazed pipe joint. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce a quality brazed pipe joint

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 5	WELD-0, W-OXY #s 0-4	3 Hours

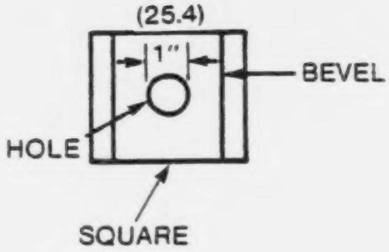
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - OXY-ACETYLENE LAP # 5
BRAZED PIPE JOINT

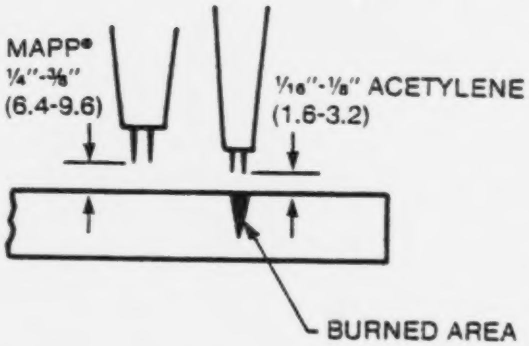
1. REVIEW Study sheet
2. DO Assignment sheet
3. CHECK Your answers to make sure they are correct
4. READ Job sheet
5. ENTER Shop using SAFETY procedures
6. GET Equipment and materials needed
7. PRACTICE Skill for Job sheet
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

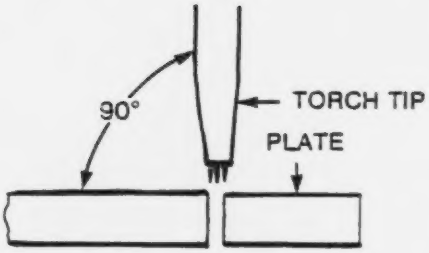
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

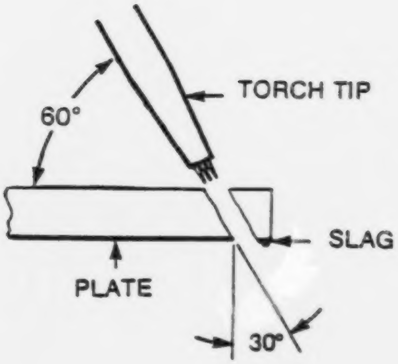
10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. RETURN Initial stamps and ball peen hammer
14. PLACE Your workpiece in your locker
15. CLEAN Your work area
16. RETURN W-OXY # 5 to the cabinet
17. GET W-OXY # 6 from the cabinet and continue

WELDING
OXY–ACETYLENE


(25.4)
1"
BEVEL
HOLE
SQUARE


MAPP®
¼"-⅜"
(6.4-9.6)
1/16"-1/8" ACETYLENE
(1.6-3.2)
BURNED AREA


90°
TORCH TIP
PLATE


TORCH TIP
60°
SLAG
PLATE
30°

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING OXY-ACETYLENE LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING OXY-ACETYLENE
LAP TITLE	FLAME CUTTING

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality square bevel and circular flame cut edges. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality square bevel and circular flame cut edges

REFERENCE Hobart School of Welding. Oxyacetylene Welding, Cutting, and Brazing. Troy, OH.

LAP #	Prerequisites	Time Range
W-OXY # 6	WELD-0, W-OXY #s 0-5	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – OXY-ACETYLENE LAP # 6
FLAME CUTTING

1. REVIEW Study sheet
2. DO Assignment sheet
3. CHECK Your answers to make sure they are correct
4. READ Job sheet
5. ENTER Shop using SAFETY procedures
6. GET Equipment and materials needed
7. PRACTICE Skill for Job sheet
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

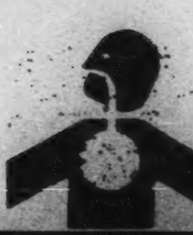
10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. RETURN Initial stamps and ball peen hammer
14. PLACE Your workpiece in your locker
15. CLEAN Your work area
16. RETURN W-OXY # 6 to the cabinet
17. SEE Your INSTRUCTOR for your next area of assignment

WELDING
SHIELD METAL ARC

WELDING - MIG
METAL INERT GAS

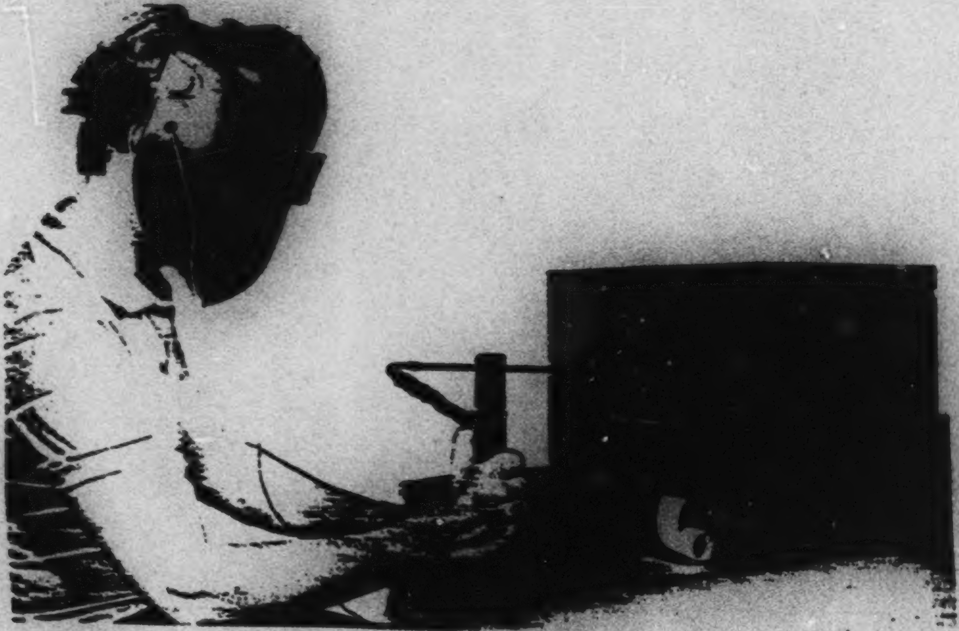
WELDING - TIG
TUNGSTEN INERT GAS

WELDING
SHIELD METAL ARC



FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	SAFETY AND PROCEDURES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to state SAFETY procedures and utilize simulator to practice angle, distance, and speed of the electrode in relationship to the workpiece. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS State SAFETY procedures

Utilize simulator to practice angle, distance, and speed of the electrode in relationship to the workpiece

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 0	WELD # 0	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 0
SAFETY AND PROCEDURES

1. GET — Video tape "Shield Metal Arc Welding - 1" from cabinet "A", slot # 33 *

2. VIEW — "Introduction to Shield Metal Arc Welding" and "Safety and Health of Welders"

3. DO — Assignment sheet (you may need to view the tape again)

4. CHECK — Your work

5. RETURN — Video tape

6. TAKE — Safety Test

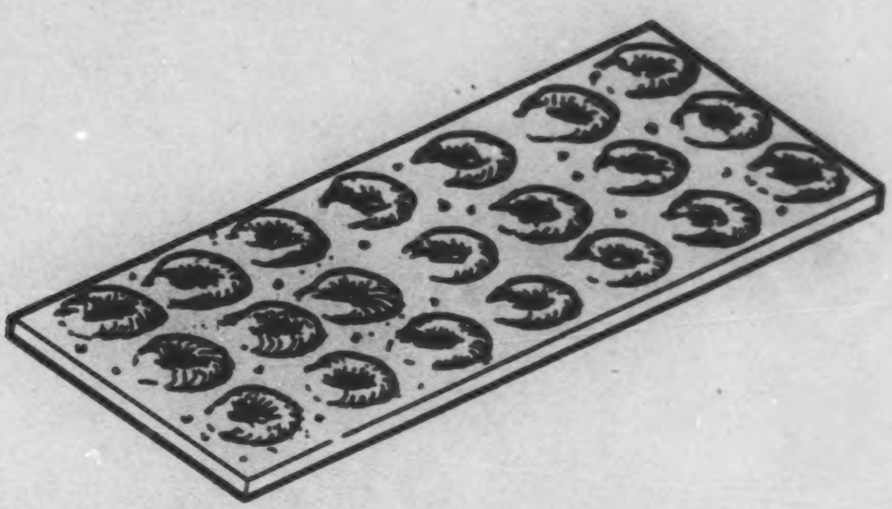
7. SIGNAL — Your INSTRUCTOR to check your work

   YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

8. RETURN — W-SMA # 0 to the cabinet

9. GET — W-SMA # 1 from the cabinet and continue

WELDING
SHIELD METAL ARC



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	BUTTON BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to demonstrate the ability to; adjust machine settings, strike an arc, manipulate the electrode, and read the puddle to produce button beads. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Demonstrate the ability to; adjust machine settings, strike an arc, manipulate the electrode, and read the puddle to produce button beads

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 1	WELD - 0, W-SMA # 0	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 1
BUTTON BEADS

1.	GET	Video tape "Shield Metal Arc Welding Basic" from cabinet "A", slot # 33 *
2.	VIEW	"Striking & Controlling the Arc in Flat Position"
3.	DO	Assignment sheet
4.	CHECK	Your work to make sure your answers are correct
5.	REWIND	Video tape and reset counter
6.	RETURN	Video tape to cabinet
7.	DO	Assignment sheet
8.	CHECK	Your answers to make sure they are correct
9.	PRACTICE	On simulator-running flat bead
10.	CHECK	When your score reaches the designated level-signal your INSPECTOR
11.	GET	Equipment to strike an arc
12.	ENTER	Welding booth and strike an arc
13.	RETURN	To classroom
14.	GET	Video tape "Shield Metal Arc Welding-1" from cabinet "A", slot # 32 *
15.	VIEW	"Pad of Beads in Flat Position & Crater Filling"
16.	DO	Assignment sheet
17.	CHECK	Your answers to make sure they are correct
18.	ENTER	Shop using SAFETY procedures
19.	GET	Equipment and materials needed
20.	GO	To welding booth
21.	PRACTICE	Making buttons
22.	DO	Job sheet

23. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

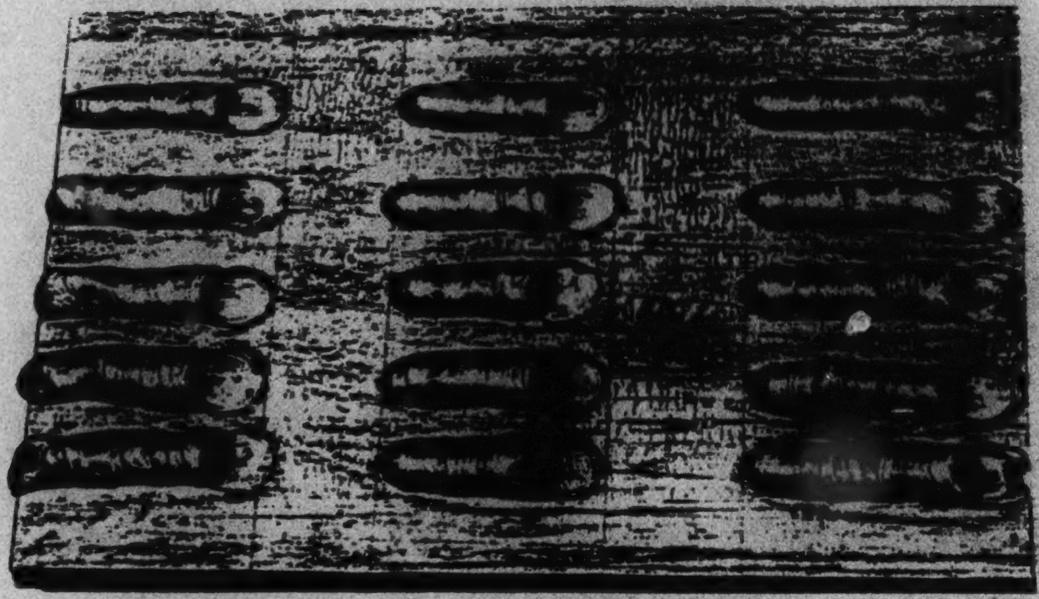
24. RETURN All equipment and materials to their proper places

25. CLEAN Your work area

26. RETURN W-SMA # 1 to the cabinet

27. GET W-SMA # 2 from the cabinet and continue

WELDING
SHIELD METAL ARC



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	SHORT BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce short beads on flat surface. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Produce short beads on flat surface

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 2	WELD-0, W-SMA #s 0-1	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 2
SHORT BEADS

1. GET Video tape "W-SMA Basic-2" from cabinet "A", slot # 33 **
2. VIEW "Fillet Weld, LAP Joint, Horizontal Position"
3. REWIND Video tape and reset counter
4. DO Assignment sheet (you may need to view again)
5. RETURN Video tape to cabinet "A", slot # 33 **
6. REVIEW Job sheet
7. ENTER Shop using SAFETY procedures
8. PRACTICE Simulator until you reach designated level
9. SIGNAL Your INSPECTOR to check your work

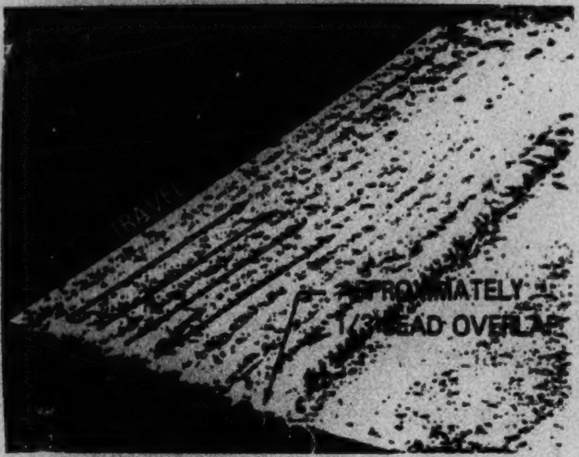
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. REVIEW Job sheet
11. GET Equipment and materials needed
12. ENTER Welding booth
13. PRACTICE Skill needed for Job sheet
14. DO Job sheet
15. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

16. RETURN All equipment and materials to their proper places
17. CLEAN Your work area
18. RETURN W-SMA # 2 to cabinet
19. GET W-SMA # 3 from cabinet and continue

WELDING
SHIELD METAL ARC


TRAVEL
APPROXIMATELY
1/3 BEAD OVERLAP

LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	PAD OF BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce a pad of beads in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Produce a pad of beads in flat position

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 3	WELD-0, W-SMA #s 0-2	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 3
PAD OF BEADS

1. GET Video tape "W-SMA Basic-2" from cabinet "A", slot # 33 **
2. VIEW "Pad of Beads in Flat Position"
3. REWIND Video tape and reset counter
4. DO Assignment sheet (you may need to view again)
5. RETURN Video tape to cabinet "A", slot # 33 **
6. REVIEW Job sheet
7. ENTER Shop using SAFETY procedures
8. PRACTICE Simulator until you reach designated level
9. SIGNAL Your INSPECTOR to check your work

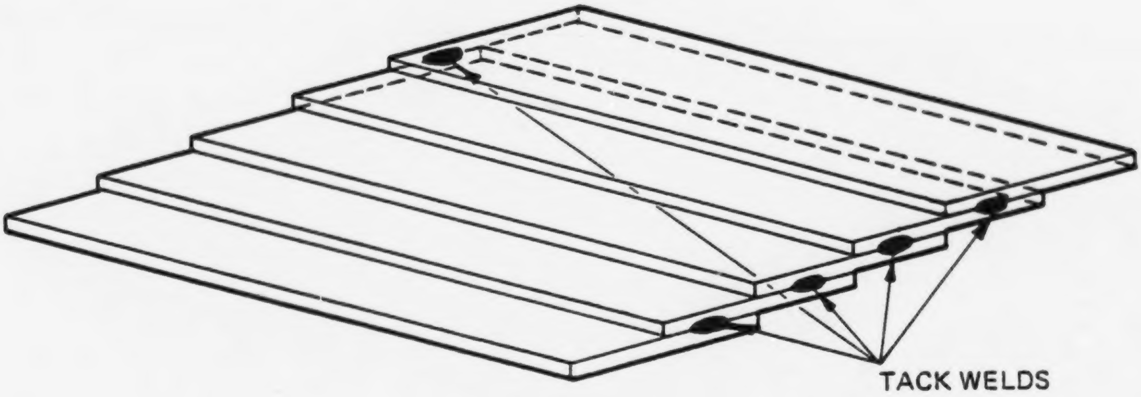
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. REVIEW Job sheet
11. GET Equipment and materials needed
12. ENTER Welding booth
13. PRACTICE Skill needed for Job sheet
14. DO Job sheet
15. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

16. RETURN All equipment and materials to their proper places
17. CLEAN Your work area
18. RETURN W-SMA # 3 to cabinet
19. GET W-SMA # 4 from cabinet and continue

WELDING
SHIELD METAL ARC



LAP # 4

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	LAP JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce a fillet weld lap joint. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Produce a fillet weld lap joint

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 4	WELD-0, W-SMA #s 0-3	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 4
LAP JOINT

1.	GET	Video tape "W-SMA Basic-2" from cabinet "A", slot # 34 *
2.	VIEW	"Fillet Weld, LAP Joint, Horizontal Position"
3.	REWIND	Video tape and reset counter
4.	DO	Assignment sheet (you may need to view again)
5.	RETURN	Video tape to cabinet "A", slot # 33 **
6.	REVIEW	Job sheet
7.	ENTER	Shop using SAFETY procedures
8.	PRACTICE	Simulator until you reach designated level
9.	SIGNAL	Your INSPECTOR to check your work

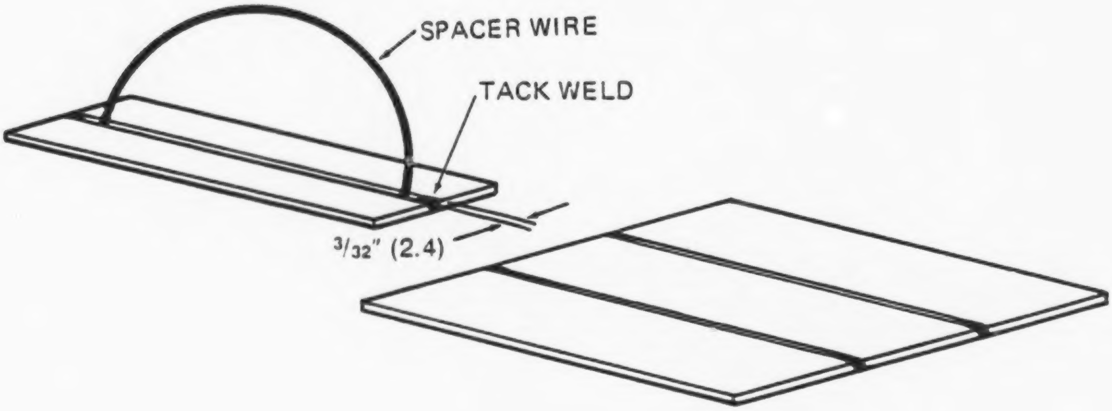
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10.	REVIEW	Job sheet
11.	GET	Equipment and materials needed
12.	ENTER	Welding booth
13.	PRACTICE	Skill needed for Job sheet
14.	DO	Job sheet
15.	SIGNAL	Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

16.	RETURN	All equipment and materials to their proper places
17.	CLEAN	Your work area
18.	RETURN	W-SMA # 4 to cabinet
19.	GET	W-SMA # 5 from cabinet and continue

WELDING
SHIELD METAL ARC


SPACER WIRE
TACK WELD
3/32" (2.4)

LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	BUTT JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to Produce square groove butt joint in horizontal position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Produce square groove butt joint in horizontal position

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 5	WELD-0, W-SMA #s 0-4	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 5
BUTT JOINT

1. GET Video tape "W-SMA Basic-2" from cabinet "A", slot # 33 **
2. VIEW "Square Groove Weld, Butt Joint, Horizontal Position"
3. REWIND Video tape and reset counter
4. DO Assignment sheet (you may need to view again)
5. RETURN Video tape to cabinet "A", slot # 33 **
6. REVIEW Job sheet
7. ENTER Shop using SAFETY procedures
8. PRACTICE Simulator until you reach designated level
9. SIGNAL Your INSPECTOR to check your work

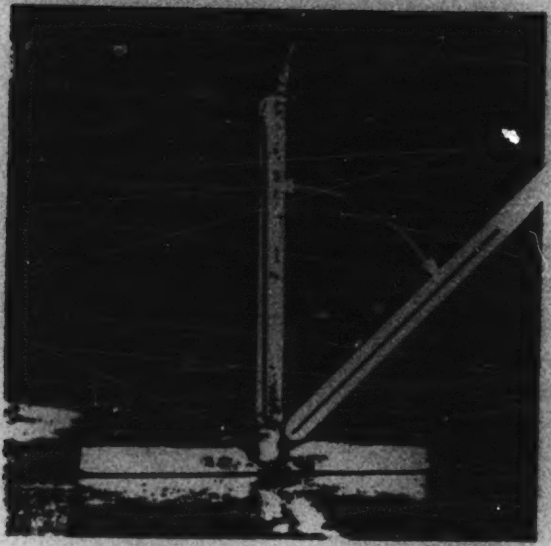
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. REVIEW Job sheet
11. GET Equipment and materials needed
12. ENTER Welding booth
13. PRACTICE Skill needed for Job sheet
14. DO Job sheet
15. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

16. RETURN All equipment and materials to their proper places
17. CLEAN Your work area
18. RETURN W-SMA # 5 to cabinet
19. GET W-SMA # 6 from cabinet and continue

WELDING
SHIELD METAL ARC



LAP # 6

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING SHIELD METAL ARC LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - SHIELD METAL ARC
LAP TITLE	TEE JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce fillet weld (3 bead) Tee joint in horizontal position and perform visual inspection. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS Produce fillet weld (3 bead) Tee joint in horizontal position and perform visual inspection

REFERENCES Hobart School of Welding. Shielded Metal - Arc Welding. Troy, OH.

Walker, John R. Arc Welding Basic Fundamentals. The Goodheart-Willcox Co., Inc. South Holland, IL. 1981.

LAP #	Prerequisites	Time Range
W-SMA # 6	WELD-0, W-SMA #s 0-5	3 Hours

413

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING SHIELD METAL ARC LAP # 6
TEE JOINT

1. GET Video tape "W-SMA Basic-2" from cabinet "A", slot # 33 **
2. VIEW "Fillet Weld, TEE Joint, Horizontal Position and Break Test"
3. REWIND Video tape and reset counter
4. DO Assignment sheet (you may need to view again)
5. RETURN Video tape to cabinet "A", slot # 33 **
6. REVIEW Job sheet
7. ENTER Shop using SAFETY procedures
8. PRACTICE Simulator until you reach designated level
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

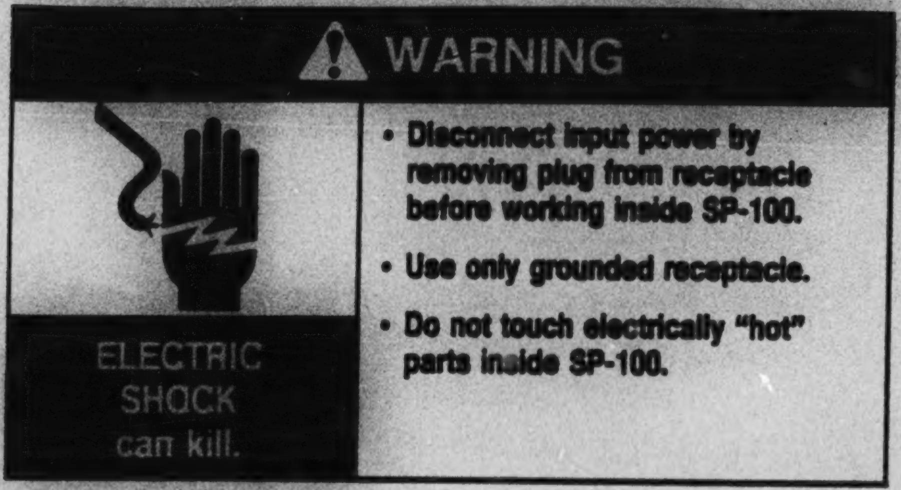
10. REVIEW Job sheet
11. GET Equipment and materials needed
12. ENTER Welding booth
13. PRACTICE Skill needed for Job sheet
14. DO Job sheet
15. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

16. RETURN All equipment and materials to their proper places
17. CLEAN Your work area
18. RETURN W-SMA # 6 to cabinet
19. GET W-OXY # 0, if you have completed this area also, then get LAP W-MIG # 0

METAL FABRICATION

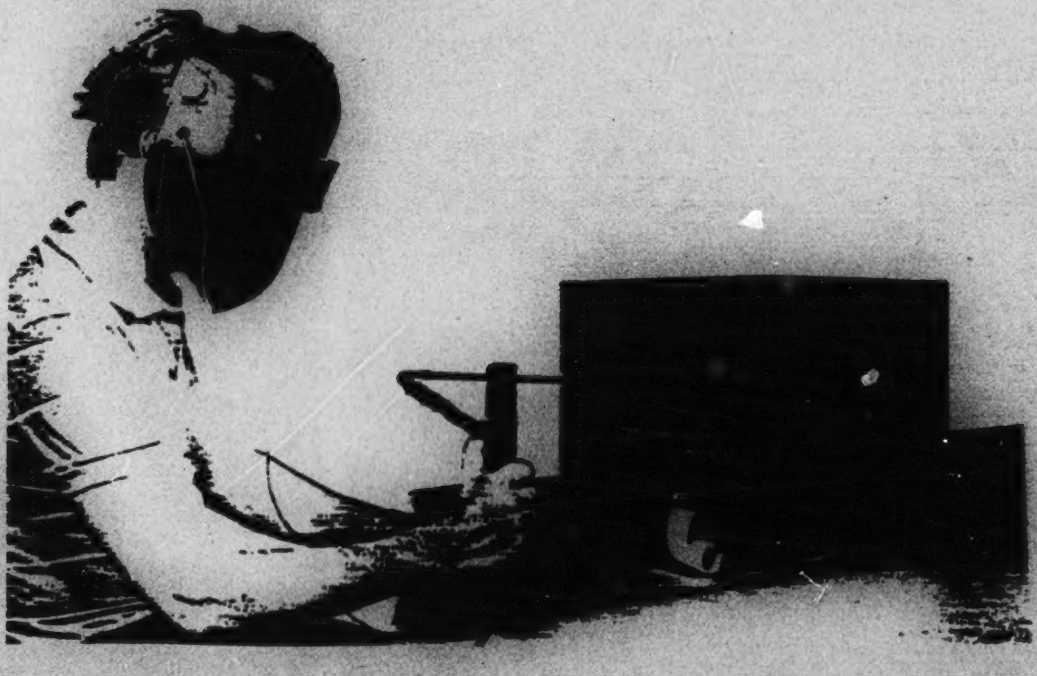
WELDING – MIG
METAL INERT GAS



WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power by removing plug from receptacle before working inside SP-100.**
- **Use only grounded receptacle.**
- **Do not touch electrically "hot" parts inside SP-100.**



LAP # 0

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — MIG LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	SAFETY AND PROCEDURES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to state SAFETY rules and procedures, demonstrate equipment setting, and practice on simulator feed, speed, and angle. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS State SAFETY rules and procedures, demonstrate equipment setting, and practice on simulator feed, speed, and angle

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

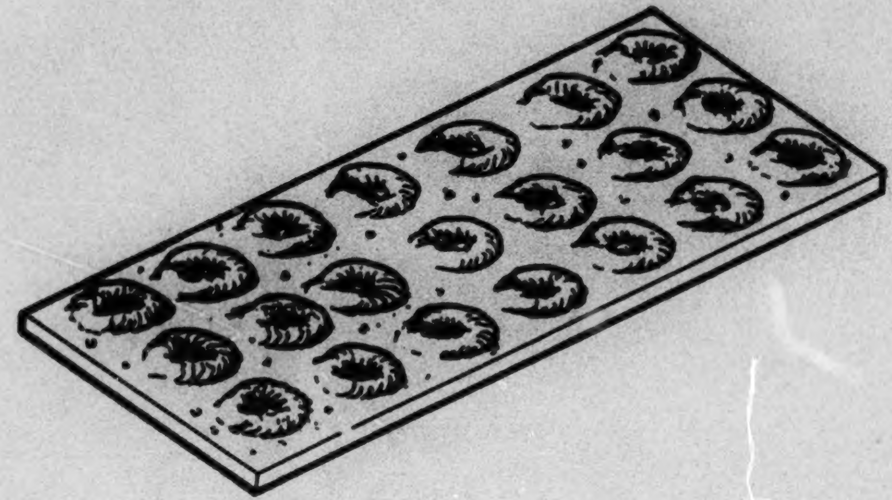
LAP #	Prerequisites	Time Range
W-MIG # 0	WELD-0, OXY, & ARC LAPs	3 Hours

416

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – MIG LAP # 0
SAFETY AND PROCEDURES

1.	GET	Video tape "Introduction to MIG" from cabinet "A", slot # 31 **
2.	VIEW	Video tape
3.	REWIND	Video tape and reset counter
4.	DO	Assignment sheet
5.	CHECK	Your answers to make sure they are correct
6.	RETURN	Video tape to cabinet "A", slot # 31 **
7.	TAKE	Safety Test
8.	ENTER	Shop using SAFETY procedures
9.	PRACTICE	On simulator until designated competency has been reached
10.	CHECK	When your score has reached designated level signal your INSPECTOR
11.	RETURN	W-MIG # 1 to cabinet
12.	GET	W-MIG # 2 from cabinet and continue

WELDING - MIG
METAL INERT GAS



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING – MIG LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	BUTTON BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce button beads in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce button beads in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 1	WELD-0, OXY, ARC LAPs	3 Hours

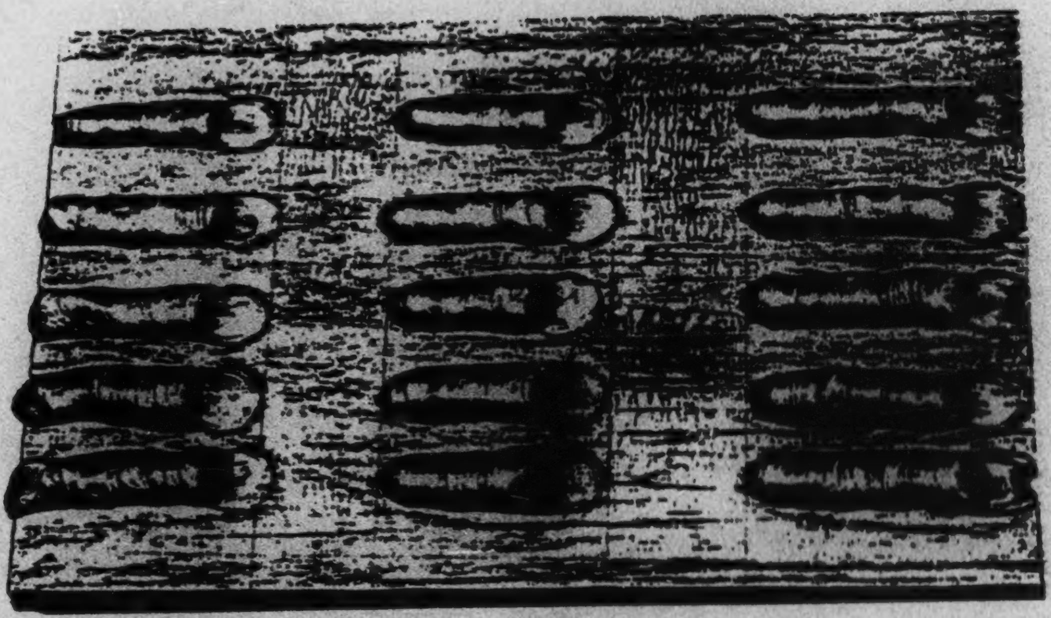
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - MIG LAP # 1
BUTTON BEADS

1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-MIG # 2 from the cabinet and continue

WELDING - MIG
METAL INERT GAS



LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — MIG LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	SHORT BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality short beads in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality short beads in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 2	WELD-O, OXY, ARC LAPs	3 Hours

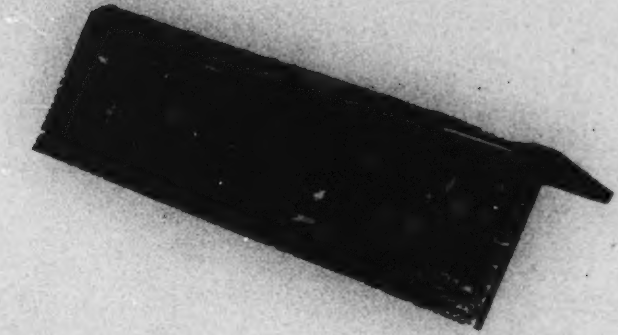
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – MIG LAP # 2
SHORT BEADS

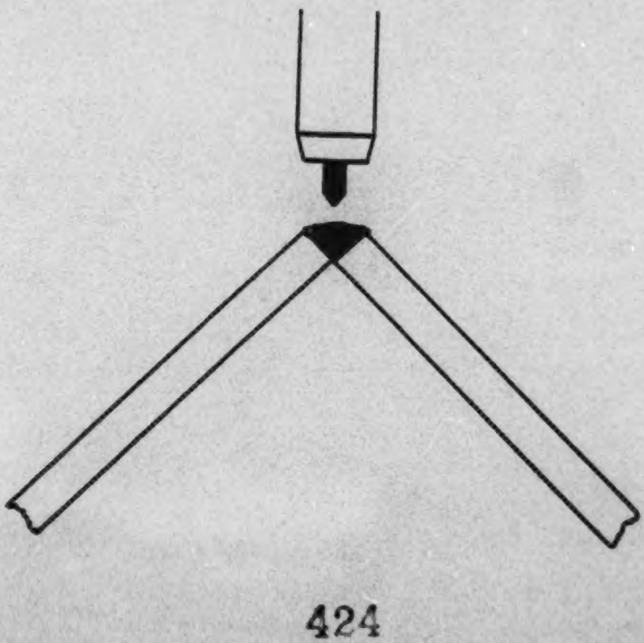
1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-MIG # 3 from the cabinet and continue

WELDING - MIG
METAL INERT GAS





LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — MIG LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	OUTSIDE CORNER JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality outside corner joint in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality outside corner joint in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 3	WELD-0, OXY, ARC LAPs	3 Hours

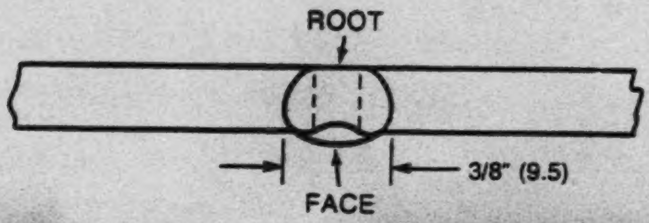
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - MIG LAP # 3
OUTSIDE CORNER JOINT

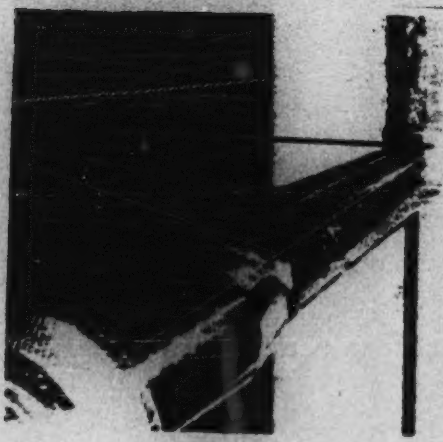
1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-MIG # 4 from the cabinet and continue

WELDING - MIG
METAL INERT GAS


ROOT
3/8" (9.5)
FACE



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — MIG LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	LAP JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality lap joint in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality lap joint in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 4	WELD-O, OXY, ARC LAPs	3 Hours

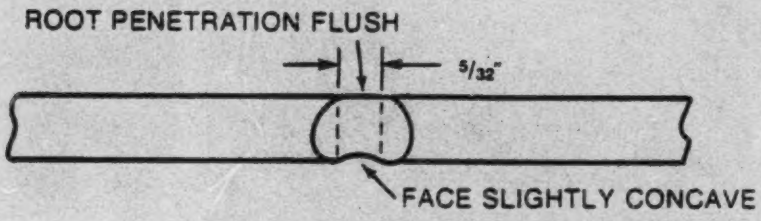
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - MIG LAP # 4
LAP JOINT

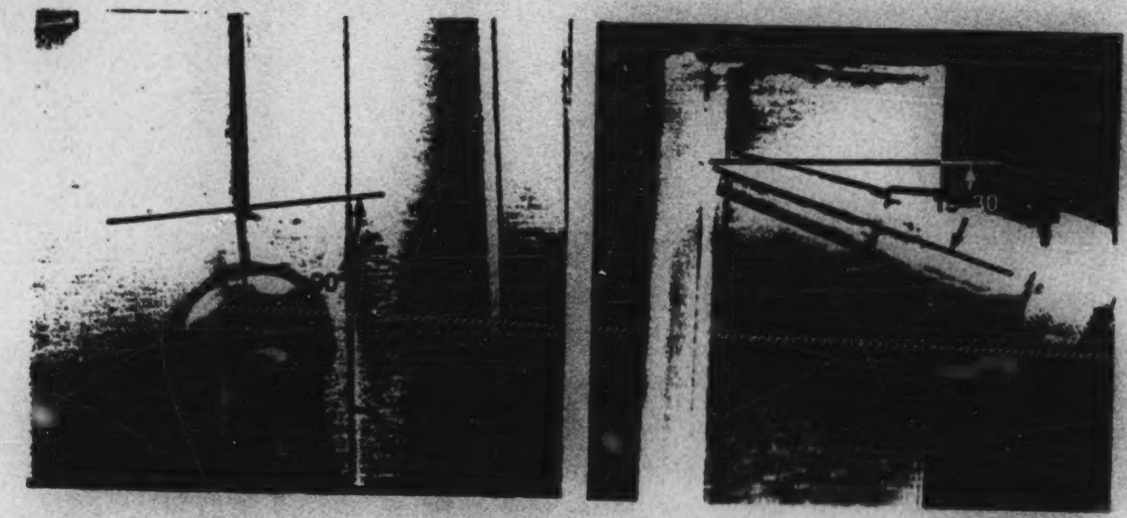
1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-MIG # 5 from the cabinet and continue

WELDING – MIG
METAL INERT GAS


ROOT PENETRATION FLUSH
5/32"
FACE SLIGHTLY CONCAVE



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING - MIG LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	BUTT JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality butt joint in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality butt joint in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 5	WELD-O, OXY, ARC LAPs	3 Hours

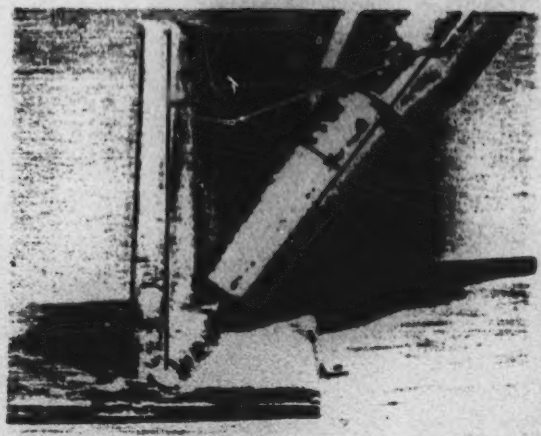
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – MIG LAP # 5
BUTT JOINT

1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-MIG # 6 from the cabinet and continue

WELDING - MIG
METAL INERT GAS



INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING – MIG LAP # 6

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - METAL INERT GAS
LAP TITLE	TEE JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce quality tee joint in flat position. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce quality tee joint in flat position

REFERENCES

Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-MIG # 6	WELD-0, OXY, ARC LAPs	3 Hours

434

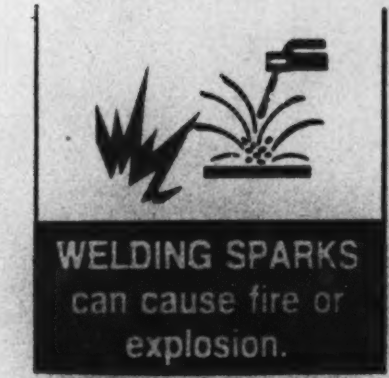
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - MIG LAP # 6
TEE JOINT

1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-TIG # 0 from the cabinet and continue

WELDING - TIG
TUNGSTEN INERT GAS


WELDING SPARKS
can cause fire or
explosion.

- Keep flammable material away.
- Do not weld upon containers which have held combustibles.

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING – TUNGSTEN INERT GAS LAP # 0

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - TUNGSTEN INERT GAS
LAP TITLE	SAFETY AND PROCEDURES

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to state SAFETY rules and set-up procedure and practice on simulator for feed, speed, and angle. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASKS State SAFETY rules and set-up procedure and practice on simulator for feed, speed, and angle

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

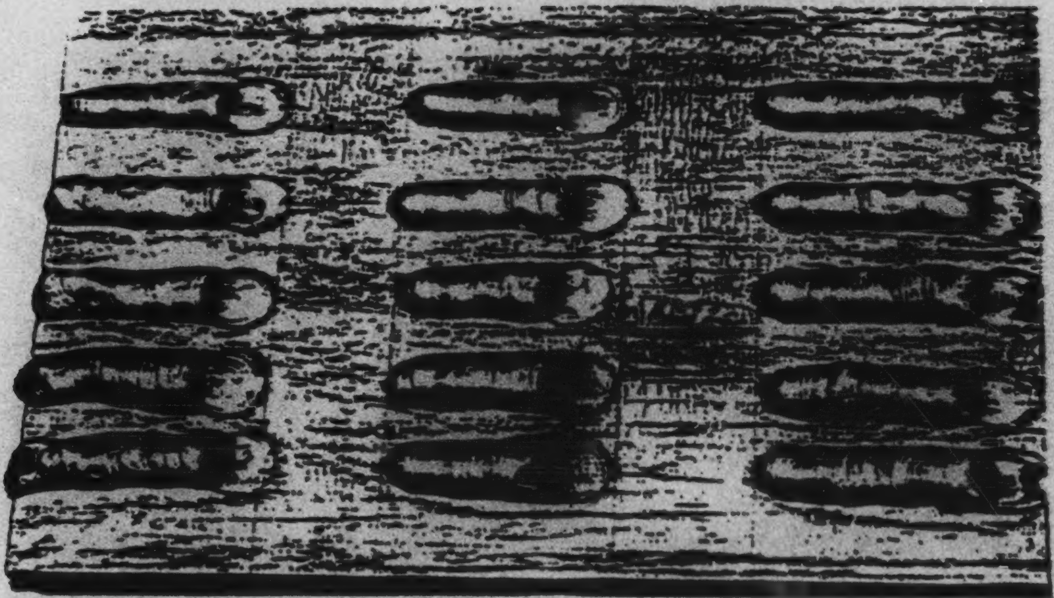
Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 0	WELD-0, W-MIG LAPs	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - TIG LAP # 0
SAFETY AND PROCEDURES

1. GET Video tape "Introduction to TIG" from cabinet "A", slot # 31 *
2. VIEW Video tape
3. REWIND Video tape and reset counter
4. REVIEW Study sheet
5. DO Assignment sheet
6. CHECK Your answers to make that they are correct
7. RETURN Video tape to cabinet "A", slot # 31 *
8. TAKE Safety Test
9. SIGNAL Your INSTRUCTOR to check your test
10. REVIEW Study sheets on simulator
11. ENTER Shop using SAFETY procedures
12. PRACTICE On simulator until designated competency has been reached
13. SIGNAL Your INSPECTOR when your scores have reached designated level
14. RETURN All equipment and materials to their proper places
15. GET W-TIG # 1 from cabinet and continue

WELDING – TIG
TUNGSTEN INERT GAS



LAP # 1

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING – TUNGSTEN INERT GAS LAP # 1

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA METAL FABRICATION

INSTRUCTIONAL UNIT WELDING - TUNGSTEN INERT GAS

LAP TITLE SHORT BEADS

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce short beads in flat position on aluminum stock. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce short beads in flat position on aluminum stock

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 1	TIG # 0 LAP	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - TIG LAP # 1
SHORT BEADS

1. REVIEW Job sheet

2. ENTER Shop using SAFETY procedures

3. PRACTICE Simulator until designated level is reached

4. SIGNAL Your INSTRUCTOR to check your work

5. GET Equipment and materials needed

6. ENTER Welding booth

7. PRACTICE Button beads

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places

11. GET Initial stamps and a ball peen hammer

12. STAMP Your initials on the backside of your workpiece

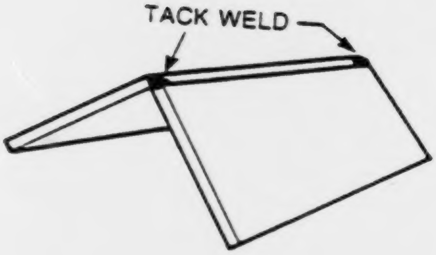
13. PLACE Your workpiece in your locker

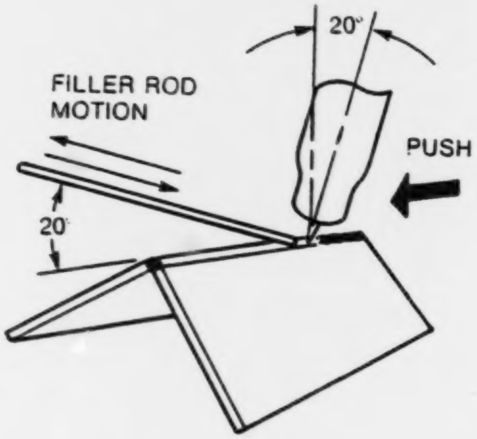
14. RETURN Initial stamps and ball peen hammer

15. CLEAN Your work area

16. GET W-TIG # 2 from the cabinet and continue

WELDING - TIG
TUNGSTEN INERT GAS




20°
FILLER ROD MOTION
PUSH
20°

LAP # 2

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING - TUNGSTEN INERT GAS LAP # 2

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - TUNGSTEN INERT GAS
LAP TITLE	OUTSIDE CORNER JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce outside corner joint in flat position on aluminum stock. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce outside corner joint in flat position on aluminum stock

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 2	W-MIG #s 0-1	3 Hours

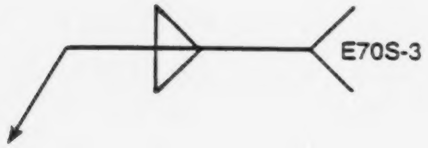
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - TIG LAP # 2
OUTSIDE CORNER JOINT

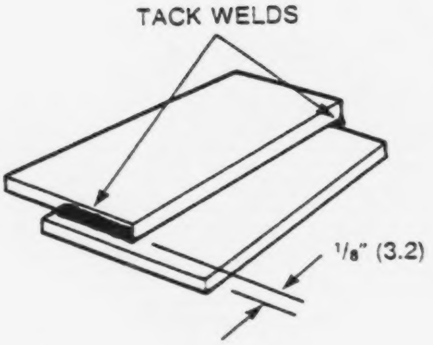
1.	REVIEW	Job sheet
2.	ENTER	Shop using SAFETY procedures
3.	PRACTICE	Simulator until designated level is reached
4.	SIGNAL	Your INSTRUCTOR to check your work
5.	GET	Equipment and materials needed
6.	ENTER	Welding booth
7.	PRACTICE	Button beads
8.	DO	Job sheet
9.	SIGNAL	Your INSPECTOR to check your work

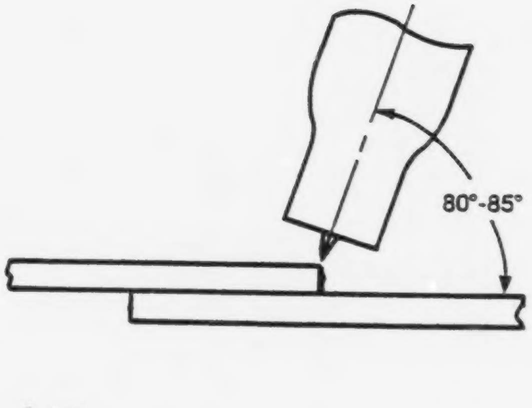
YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10.	RETURN	All equipment and materials to their proper places
11.	GET	Initial stamps and a ball peen hammer
12.	STAMP	Your initials on the backside of your workpiece
13.	PLACE	Your workpiece in your locker
14.	RETURN	Initial stamps and ball peen hammer
15.	CLEAN	Your work area
16.	GET	W-TIG # 3 from the cabinet and continue

WELDING - TIG
TUNGSTEN INERT GAS




TACK WELDS
1/8" (3.2)



LAP # 3

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — TUNGSTEN INERT GAS LAP # 3

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - TUNGSTEN INERT GAS
LAP TITLE	LAP JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce lap joint in flat position on aluminum stock. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce lap joint in flat position on aluminum stock

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 3	W-MIG #s 0-2	3 Hours

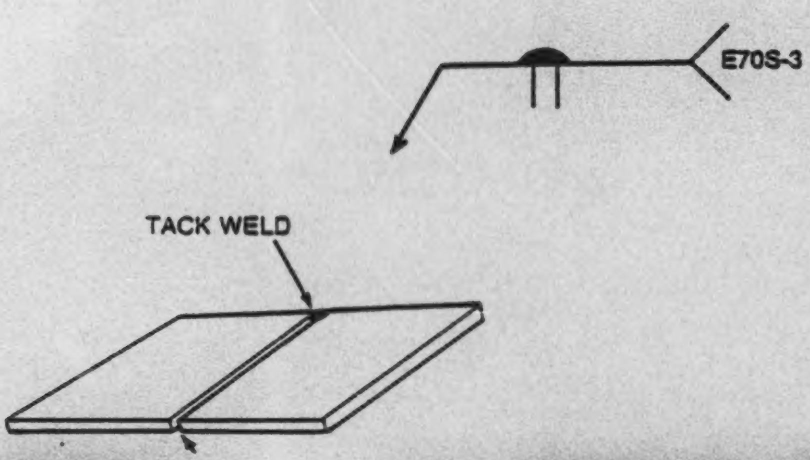
LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - TIG LAP # 3
LAP JOINT

1. REVIEW Job sheet
2. ENTER Shop using SAFETY procedures
3. PRACTICE Simulator until designated level is reached
4. SIGNAL Your INSTRUCTOR to check your work
5. GET Equipment and materials needed
6. ENTER Welding booth
7. PRACTICE Button beads
8. DO Job sheet
9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places
11. GET Initial stamps and a ball peen hammer
12. STAMP Your initials on the backside of your workpiece
13. PLACE Your workpiece in your locker
14. RETURN Initial stamps and ball peen hammer
15. CLEAN Your work area
16. GET W-TIG # 4 from the cabinet and continue

WELDING - TIG
TUNGSTEN INERT GAS


E70S-3
TACK WELD

INDUSTRIAL AUTOMATION MAINTENANCE
MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING – TUNGSTEN INERT GAS LAP # 4

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - TUNGSTEN INERT GAS
LAP TITLE	BUTT JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce butt joint in flat position on aluminum stock. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce butt joint in flat position on aluminum stock

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 4	W-MIG #s 0-3	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING – TIG LAP # 4
BUTT JOINT

1. REVIEW Job sheet

2. ENTER Shop using SAFETY procedures

3. PRACTICE Simulator until designated level is reached

4. SIGNAL Your INSTRUCTOR to check your work

5. GET Equipment and materials needed

6. ENTER Welding booth

7. PRACTICE Button beads

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places

11. GET Initial stamps and a ball peen hammer

12. STAMP Your initials on the backside of your workpiece

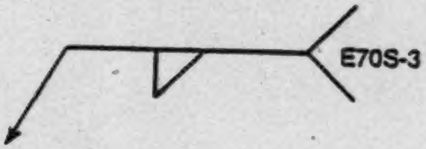
13. PLACE Your workpiece in your locker

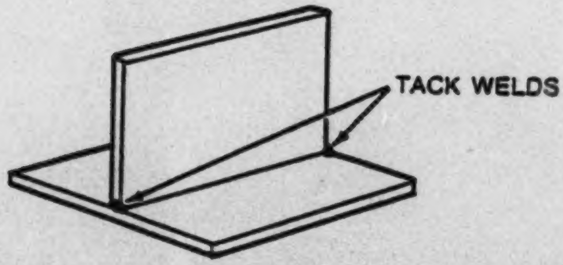
14. RETURN Initial stamps and ball peen hammer

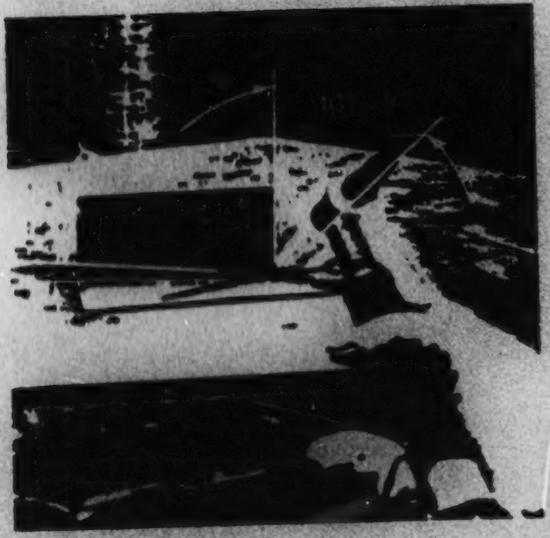
15. CLEAN Your work area

16. GET W-TIG # 5 from the cabinet and continue

WELDING - TIG
TUNGSTEN INERT GAS







LAP # 5

INDUSTRIAL AUTOMATION MAINTENANCE MECHANICS PROGRAM
LIBBEY SKILL CENTER, TOLEDO, OHIO
WELDING — TUNGSTEN INERT GAS LAP # 5

LEARNING ACTIVITY PACKET

MAJOR INSTRUCTIONAL AREA	METAL FABRICATION
INSTRUCTIONAL UNIT	WELDING - TUNGSTEN INERT GAS
LAP TITLE	TEE JOINT

PERFORMANCE OBJECTIVE After completion of this LAP, you should be able to produce tee joint in flat position on aluminum stock. This knowledge will be demonstrated through a study sheet, an assignment sheet, a job sheet, and a unit test with a minimum of 85% accuracy.

TASK Produce tee joint in flat position on aluminum stock

REFERENCES Griffin, Ivan H., Roden, Edward M., & Briggs, Charles W. Basic TIG & MIG Welding. Third Edition. Delmar Publishers. Albany, NY. 1984.

Hobart School of Welding Technology. Gas Tungsten Arc Welding. Troy, OH.

LAP #	Prerequisites	Time Range
W-TIG # 5	W-MIG #s 0-4	3 Hours

LEARNING ACTIVITY PACKET GUIDE
METAL FABRICATION
WELDING - TIG LAP # 5
TEE JOINT

1. REVIEW Job sheet

2. ENTER Shop using SAFETY procedures

3. PRACTICE Simulator until designated level is reached

4. SIGNAL Your INSTRUCTOR to check your work

5. GET Equipment and materials needed

6. ENTER Welding booth

7. PRACTICE Button beads

8. DO Job sheet

9. SIGNAL Your INSPECTOR to check your work

YOUR INSTRUCTOR WILL GIVE YOU SPECIFIC INSTRUCTIONS IF YOU NEED TO CONTINUE WITH THIS LAP

10. RETURN All equipment and materials to their proper places

11. GET Initial stamps and a ball peen hammer

12. STAMP Your initials on the backside of your workpiece

13. PLACE Your workpiece in your locker

14. RETURN Initial stamps and ball peen hammer

15. CLEAN Your work area

16. GIVE Yourself a hand for finishing